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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 23
DECEMBER 1, 1976

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 23
DECEMBER 1, 1976

W76-12151 -- W76-12675

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

WATER -- UNUSUAL RAW MATERIAL AT THE SERVICE OF THE PAPER INDUSTRY (L'EAU -- MATIERE PREMIERE ANORMALE AU SERVICE DU PAPETIER),
For primary bibliographic entry see Field 3E.
W76-12484

2. WATER CYCLE

2A. General

DERIVATION OF TIME OF CONCENTRATION,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W76-12196

SOME ASPECTS OF STOCHASTIC RESERVOIR THEORY,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 4A.
W76-12197

WATER BALANCE IN UGANDA,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
O. Ojo.
Occasional Paper No. 53, 1974. 70 p, 6 fig, 18 maps, 2 tab, 50 ref.

Descriptors: *Africa, *Water balance, *Climates, *Indian Ocean, *Evapotranspiration, Hydrologic cycle, Energy, Soil moisture, Transpiration, Evaporation pans, Seasonal, Rainfall, Lysimeters, Irrigation, Rain gages.
Identifiers: *Uganda, East Africa, *Outflow components, Potential evapotranspiration, Soil moisture storage, Hours of sunshine.

An evaluation of the water balance of Uganda was made to include not only rainfall and temperature but also evapotranspiration. Reference was made to past studies, such as Thornthwaite and Penman, and explanations were given on the basic definitions of the concept of the water balance as well as the variations in the components and the factors affecting them. The distributions of annual values of potential evapotranspiration as well as the values for January, March, June, and September were discussed. The annual and monthly values of the water balance as well as tables of the water balance for some stations in the country were given. It was recognized that although monthly water balanced computation had been done, computation for daily or weekly periods would have been more practical for applying irrigation. (Roberts - ISWS)
W76-12204

RAINFALL GENERATION: A NONSTATIONARY TIME-VARYING MULTIDIMENSIONAL MODEL,
Puerto Rico Univ., Mayaguez. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-12208

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 496, $7.75 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 116, July 1976. 196 p, 19 fig, 4 tab, 11 ref, 7 append. OWRT B-064-NC(2). 14-31-0001-4112.

Descriptors: *Streamflow forecasting, *Streamflow, *Watersheds(Basins), Digital computers, Rainfall, Reservoir sites, Lakes, Evapotranspiration, Rainfall-runoff relationships, *North Carolina, Model studies, Computer models, Simulation analysis, Regional analysis.
Identifiers: *Flow estimates, *Streamflow Synthesis and Reservoir Regulation(SSARR), *Hydrologic Information Storage and Retrieval System(HISARS), Sub-basins, Neuse River(NC), Yadkin River(NC).

A system has been developed for simulation of streamflow data at any point in a region. The system is known as NCSSARR (North Carolina version of the Streamflow Synthesis and Reservoir Regulation model). NCSSARR is based on the Streamflow Synthesis and Reservoir Regulation (SSARR) model developed at the North Pacific Division of the Corps of Engineers in Portland, Oregon. Control programming minimizes input requirements to permit a planner with limited hydrologic or computer background to use the system. The system is interfaced with the data storage and retrieval system known as HISARS to provide convenient data access as well as routine processing of the simulated streamflow. NCSSARR permits a broad range of capabilities, ranging from fairly simple simulation requiring minimal input to very sophisticated simulation utilizing the full capabilities of SSARR but requiring extensive input. Streamflow can be simulated for small relatively homogeneous watersheds or for large streams combining flow from a number of different areas. This report provides a general description of the system. Other chapters deal with hydrologic and computer procedures to implement the system, and describe a series of tests, comparing simulated flows with observed records. Documentation of the programs is provided in Appendices. (Stewart-North Carolina State)
W76-12250

ON HYDROBIOLOGY: CRITICAL MISAPPREHENSIONS CONCERNING THE DISCIPLINE, (IN HUNGARIAN),
Lajos Kossuth. Univ., Debrecen (Hungary). Zoological Inst.
G. Devai.
Acta Biol Debrecina. 10/11, p 101-116, 1972.

Descriptors: *Hydrobiology, Hydrologic aspects, Biology, Oceanography, Hydrology.
Identifiers: Biotope, *Cryobiology, Disciplines, *Limnobiology, *Potamobiology, *Stigobiology.

According to the International Association for Scientific Hydrology, this science consists of the branches: potamology, limnology, cryology and stigology. A definition of the science of hydrobiology and a statement of purpose are given. This science consists of 5 fields of study; oceanobiology, limnobiology, potamobiology, stigobiology and cryobiology. Basically, all are concerned with 'water quality', which is defined as the degree of complementary interaction between the animate and inanimate components of a biotope. A correct evaluation of the interrelationships of these components is integral to an accurate prediction of the future state of a body of water.--Copyright 1975, Biological Abstracts, Inc.
W76-12269

ESTIMATING GROUNDWATER EVAPOTRANSPIRATION FROM STREAMFLOW RECORDS,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 2D.
W76-12285

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5B.
W76-12435

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-12436

PLOT-DERIVED PARAMETERS FOR BASIN COMPUTATIONS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
G. H. Comer, and H. N. Holtan.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 53-59, March 1976. 3 fig, 2 tab, 7 ref.

Descriptors: *Basins, *Model studies, *Digital computers, *Runoff, Watersheds(Basins), Hydrologic systems, Soil analysis, Crops, Hydrology, Data collections.
Identifiers: Plot-derived parameters, *Basin computations, Plots, Digital basin model, Cropping patterns, Hydrological records, Watershed hydrology, Climatological data.

Data from small plots within a basin were used with a digital basin model to estimate parameters for computing runoff from the entire basin. The Hydrograph Laboratory of the United States Department of Agriculture developed and tested a mathematical model which treated a basin as a distributed system to operate on homogeneous hydrological response units of the basin. The parameters inferred from soils and crop data were optimized using the digital model to compute runoff from the plots. The optimized values of soil and crop parameters were then used to compute the runoff from the total basin. The data requirements for the model included the climatological data, basin descriptors, and soil parameters. Climatological data included precipitation, air temperature, and evaporation rate. Basin data required land use data, soil data, and crop data. The results demonstrated the value of plot data and the importance of a deterministic model which used parameters derived from readily available soil and crop data. (Roberts-ISWS)
W76-12438

WATER YIELD MODEL USING SCS CURVE NUMBERS,
Agricultural Research Service, Temple, Tex.
J. R. Williams, and W. V. LaSeur.
Journal of the Hydraulics Division, Vol 102, No HY9, p 1241-1253, September 1976. 6 tab, 6 ref.

Descriptors: *Agricultural watersheds, *Reservoir design, *Runoff, *Soil moisture, *Water yield, Soil conservation, Mathematical models, Equations, Simulation analysis, Optimization, Computers, Rainfall, Systems analysis.

A model was developed to predict daily runoff from agricultural watersheds with areas up to 2,590 km2. The model is based on the SCS runoff curve number procedure and a soil moisture index. It was designed to have general applicability, computational efficiency, simple inputs, and good prediction accuracy. The model has one parameter, uses a 1-day time interval, and only outputs runoff volume. Inputs are an estimate of the II-condition SCS runoff curve number, measured monthly runoff, daily rainfall, and average monthly lake evaporation. The model is calibrated on a gaged

watershed and can be used to extend short periods of record for the calibrated watershed or to predict water yield for nearby ungaged watersheds. In tests with data from 47 watersheds in Texas, the model simulated runoff fairly accurately. Applications include reservoir design, water quality modeling, and flood control evaluation. (Bell-Cornell)
W76-12522

2B. Precipitation

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - EXPERIMENT DESCRIPTION,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
For primary bibliographic entry see Field 7B.
W76-12178

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - DATA REDUCTION AND ANALYSIS,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
For primary bibliographic entry see Field 7B.
W76-12179

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - APPENDICES.
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
For primary bibliographic entry see Field 7B.
W76-12180

STUDY OF THE LOWER STRATOSPHERIC THERMAL STRUCTURE AND TOTAL OZONE FROM NIMBUS-4 IRIS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
C. Prabhakara, and E. B. Rodgers.
NASA Technical Note D-8134, January 1976. 35 p, 25 fig, 19 ref, 1 append.

Descriptors: *Ozone, *Temperature, *Remote sensing, Satellites(Artificial), Infrared radiation, *Atmosphere, Maps, Mapping, Monthly, Measurement, Circulation, Meteorology, Equations.
Identifiers: *Nimbus-4, *Stratosphere, Lower stratosphere, Global distribution.

The global distribution of temperature in the stratosphere from 100 to 10 mbar and the total ozone in the atmosphere were remotely sensed from the Nimbus-4 IRIS measurements for a period of about one year. The temperature and ozone data were presented in the form of monthly mean global maps. The standard deviations of temperature and ozone with respect to zonal averages were calculated. The mean and the variable state of the stratosphere were discussed with the help of these observations. The lower stratosphere in the tropical regions revealed a significant wave number one pattern in the circulation. The Arctic and Antarctic stratospheric winter circulation regimes displayed a different behavior apparently due to the ocean and orographic differences. (Sims-ISWS)
W76-12184

ATMOSPHERIC STRUCTURE AND VARIABILITY IN AREAS OF CONVECTIVE STORMS DETERMINED FROM 3-H RAWINSONDE DATA,
Texas A and M Univ., College Station. Center for Applied Geosciences.
G. S. Wilson, and J. R. Scoggins.
Contractor Report NASA CR-2678, April 1976. 118 p, 65 fig, 1 tab, 32 ref, 1 append. NASA NAS8-26751.

Descriptors: *Storms, *Cloud physics, *Convection, Thunderstorms, Weather, Equations, Variability, Distribution patterns, Rainfall, Rainfall disposition, Forecasting, Measurement, Stability, Moisture, Radar, Data processing, Meteorology, *Atmosphere, Atmospheric physics.
Identifiers: *Rawinsonde data.

The structure and variability of the atmosphere in areas of radar-observed convection are established by using the unique 3-h rawinsonde and surface data from NASA's second Atmospheric Variability Experiment (AVE II) conducted on May 11 and 12, 1974. Convective activity was shown to exist in areas where the low and middle troposphere is moist and the air is potentially and convectively unstable and has upward motion, in combination with positive moisture advection, at either the surface or within the boundary layer. The large variability of the parameters associated with convective storms over time intervals less than 12 h was also demonstrated so as to possibly produce a change in the probability of convective activity by a factor of 8 or more in 3 h. Between 30 and 60% of the total changes in parameters associated with convective activity over a 12-h period was shown to take place during a 3-h period. These large changes in parameters, normally measured with 12-h data, were related to subsynoptic-scale systems that many times produced convective storms. (Sims - ISWS)
W76-12185

WATER BALANCE IN UGANDA,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-12204

RAINFALL GENERATION: A NONSTATIONARY TIME-VARYING MULTIDIMENSIONAL MODEL,
Puerto Rico Univ., Mayaguez. Dept. of Civil Engineering.
R. L. Bras, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 12, No. 3, p 450-456, June 1976. 3 fig, 2 tab, 24 ref. NWS Contract 4-36738.

Descriptors: *Rainfall, *Model studies, *Storms, Algorithms, Statistics, Water resources, Precipitation(Atmospheric), Rainfall intensity, Areal, Hyetographs, Equations.
Identifiers: *Rainfall generation, *Rainfall synthesis, Multidimensional model, Rainfall models, Exterior rainfall characteristics, Interior rainfall characteristics, Nonstationary multidimensional rainfall generator, Point rainfall.

Most existing rainfall models do not concentrate on storm exterior characteristics. Very few models attempt to generate exterior and interior rainfall characteristics everywhere in space, and those that do have limiting assumptions of stationary behavior at all levels of storm activity. Therefore, a nonstationary, multidimensional model was suggested. The suggested model, capable of simulating historical storm exteriors and interiors, assumed the validity of G. I. Taylor's hypothesis turbulence within the storm interior. First-order statistics of storm interiors as well as the correlation in time and space of the storm interiors were preserved. The model had the advantages of being based on concepts easy to understand, being multi-dimensional, and being computationally easy to implement. The research described would be applicable for any kind of rational description of the rainfall process. (Roberts - ISWS)
W76-12208

FINE-SCALE TIME VARIATIONS OF RAINFALL IN WESTERN OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
C. L. Trump, and W. P. Elliott.
Water Resources Research, Vol. 12, No. 3, p 556-560, June 1976. 3 fig, 3 tab, 11 ref.

Descriptors: *Rainfall, *Oregon, *Illinois, *Pacific Ocean, Winter, Linear programming, Statistics, Storms, Mathematical studies, Precipitation(Atmospheric), Time series analysis, On-site investigations, Variability, Seasonal, On-site data collections.
Identifiers: *Rain rates, Western Oregon rainfall, Fine-scale time variations, Winter rainy season, Nondimensional variability statistics, Illinois rainfall, Summer convective rainfall, Linear function.

One-minute rain rates were measured at three stations on a line running inland from the coast across a low mountain range during a winter rainy season. The average of three nondimensional variability statistics were significantly greater on the coast than inland. Rain rate distributions showed that a greater portion of the rain fell at higher rates on the coast, and autocorrelation analysis showed that the rainfall was less persistent on the coast than inland. Oregon results were compared with similar results concerning Illinois summer convective rainfall. Even though the Illinois rainfall was distinctly more intense and less persistent than the Oregon rainfall, the relative variabilities were surprisingly similar. The logarithm of the total rain falling at rates greater than a given rate was found to be a linear function of that rate. It was found that the concentrations of large airborne sea-salt particles, the cloud-forming nuclei, peaked at the coastline and dropped off rapidly inland. (Roberts - ISWS)
W76-12209

A HIGH SIERRA PRECIPITATION MEASUREMENT PROGRAM, FINAL REPORT ON THE 1975 SEASON,
Atmospherics Inc., Fresno, Calif.
T. J. Henderson, M. Henderson, and M. Morris.
Report, November 15, 1975. 34 p, 2 fig, 3 tab, 5 append.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Mountains, *California, Measurement, Rain gages, Rainfall disposition, Elevation, Runoff, Water temperature, On-site investigations, Meteorology, Climatology.
Identifiers: *Sierra Mountains, Rain gage network.

Historically, reliable rainfall totals at high altitudes in remote mountain areas are usually the weak link within the broad field of hydrologic studies. This has been particularly true throughout many of the high altitude regions of the Southern Sierra Range in California where precipitation measurements during the summer months have been limited to a few scattered locations. New investigations of streamflow runoff relationships, plus an increasing emphasis on more efficient water use, have focused attention on the importance of summer precipitation at elevations above 9,000 ft msl. In late 1971, Atmospherics Incorporated and the Kings River Conservation District, Fresno, California, began a series of discussions on the feasibility of establishing a temporary high altitude raingage network in the Southern Sierra Range of California. This report described the various activities associated with the 1975 High Sierra Precipitation Measurement Program and summarized the results obtained during the various network visitations in the 1972, 1973 and 1974 seasons. (Sims - ISWS)
W76-12446

THE AWS HANDBOOK OF GROUND-BASED COLD FOG DISSIPATION USING VENTED LIQUID PROPANE, VOLUME I - THEROY AND PRACTICE.
Air Weather Service, Scott AFB, Ill.
For primary bibliographic entry see Field 3B.
W76-12471

2C. Snow, Ice, and Frost

CENTRAL SIERRA PROFILING SNOW GAGE: A GUIDE TO FABRICATION AND OPERATION,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith, H. G. Halverson, and R. A. Jones.
Atomic Energy Commission, Oak Ridge, Tenn., Technical Information Center, TID-25986, February 1972. 53 p, 10 fig, 3 tab, 6 ref, 4 append.

Descriptors: *Snowpacks, Snowmelt, Radioisotopes, Snow management, Fabrication, Flood forecasting, Runoff forecasting, *Precipitation gages, Instrumentation, *California.
Identifiers: Snowpack density, Snowpack depth.

Studies at the Central Sierra Snow Laboratory in California have produced a remotely operated snow gage with which snowpacks may be profiled. Snowpack density and depth are printed in gm cm-3 and hundredths of feet from ground line to snow-air interface. Water content can be computed from the data. Detailed instructions are given for manufacture, calibration, operation, and data reduction. (Forest Service)
W76-12158

DEVELOPMENT OF A RADIOACTIVE ISOTOPE PROFILING SNOW GAGE,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith, H. G. Halverson, and R. A. Jones.
Atomic Energy Commission, Oak Ridge, Tenn., Technical Information Center, February 1972, 1972. 86 p, 28 fig, 50 ref, 2 append.

Descriptors: Radioisotopes, *California, Streamflow forecasting, Snow management, Snowmelt, Calibration, *Instrumentation, *Snowpacks, *Precipitation gages.
Identifiers: Snowpack density, Snowpack depth.

Since 1909, when the technique of snow surveying to determine water content of the snowpack was developed, many gravimetric methods have been designed and used. At the U. S. Forest Service's Central Sierra Snow Laboratory in California, seven generations of profiling snow gages using radioactive isotopes have been developed and used. The final product is a twin-probe gage with which a snowpack of any depth can be profiled. Both density in gm cm-3 for each one-half inch and depth of each location in hundredths of feet are printed on a paper tape. Calibration equations have been solved. The gage can be used for streamflow forecasting from snowmelt and for studies in snow hydrology. (Forest Service)
W76-12159

SEASONAL SNOW SURFACE ENERGY BALANCE IN A FOREST OPENING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson.
Atomic Energy Commission, Oak Ridge, Tenn., Technical Information Center, TID 26242, August 1972. 73 p, 11 fig, 3 tab, 62 ref, append.

Descriptors: Snow management, *Snowmelt, *Snowpacks, Radioisotopes, Land management, *Energy budget, *Seasonal, *Precipitation gages, Measurement, *California.
Identifiers: Snowpack density.

Calculation of seasonal energy balance is a promising method of predicting the snowpack water balance. In-situ snow density measurements were obtained in an open area 400 feet in diameter with the profiling snow gage. The water balance was estimated with snow gage data. Measurements of humidity gradients, windspeed, temperature, and net radiation were also obtained at 30-minute intervals for use in calculating the components of the energy balance for the snowpack surface. During the 1967-68 season, the water balance estimate indicated that 31.59 inches of water fell as snow and melted or evaporated between January 1 and April 26. The corresponding energy balance estimates of snow ablation totaled 32.18 inches for the same period. From December 10, 1968 to May 23, 1969, 60.85 inches water equivalent ablated according to the water balance; the energy balance predicted 60.74 inches. Evaporation as calculated by the energy balance averaged only 0.42 inches per month. Sensible heat transfer was negligible during the accumulation season. It became positive during the melt period. Net radiation averaged less than 50 cal cm-2 day-1 during the accumulation season, but during the melt period it averaged over 100 cal cm-2 day-1. Latent heat flux was usually small (less than 30 cal-2cm-1day-1) and gradually declined to zero during the late spring snowmelt season. Melt and refreezing were important forms of daily energy storage and release. (Forest Service)
W76-12160

MEASUREMENT OF SNOWPACK WETNESS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
W. I. Linlor, J. L. Smith, M. F. Meier, F. C. Clapp, and D. Angelakos.
In: Proceedings 43rd Annual Meeting Western Snow Conference, Coronado, California, Measurement of Snowpack Wetness, April 1975. p 14-20. 6 fig, 2 tab. Paper 590-75.

Descriptors: Snow management, *Snowpacks, Streamflow forecasting, *Precipitation gages, Moisture content, Measurement, Methodology, Snowmelt, Instrumentation, Capacitors, Microwaves.
Identifiers: Dielectric loss, *Electrical methods(Measurement), *Snow wetness.

Three electrical methods for measuring wetness of snow are: (1) Change in capacitance of a sample before and after freezing. (2) Dielectric loss (or quality factor) of a sample in a high-frequency field. (3) Attenuation of a microwave beam in transmission through snow. Of the three electrical methods, two require sampling, but the microwave system can be operated entirely automatically in remote installations, utilizing satellite telemetry for data gathering. (Forest Service)
W76-12162

SNOW WETNESS MEASUREMENTS FOR MELT FORECASTING,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
W. I. Linlor, F. D. Clapp, and M. F. Meier.
In: Procedings Workshop on Operational Applications of Satellite Snowcover Observations, South Lake Tahoe, Calif., August 1975, National Aeronautics and Space Administration, p 375-397, 1975. 6 fig, 3 tab, 32 ref.

Descriptors: *Runoff forecasting, *Snowmelt, *Snowpacks, Snow management, Telemetry, *Precipitation gages, *Moisture content, Water supply, Flood forecasting, Water equivalent, *Microwaves, Measurement, Instrumentation.
Identifiers: *Snow wetness.

A microwave technique for directly measuring snow pack wetness in remote installations is described. The technique, which uses satellite telemetry for data gathering, is based on the attenuation of a microwave beam in transmission through snow. (Forest Service)
W76-12165

REMOTE SENSING OR SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
M. C. McMillan, and J. L. Smith.
In: Proceedings Workshop on Operational Applications of Satellite Snowcover Observations, South Lake Tahoe, California, August 1975, National Aeronautics and Space Administration, p 361-374, 1975. 6 tab, 26 ref.

Descriptors: *Snowpacks, *Snowmelt, Snow management, *Albedo, Measurement, Runoff forecasting, Flood prediction, *Precipitation gages, *Radiation, *Remote sensing.
Identifiers: *Snowpack density.

Albedo or satellite radiance measurements can be used to estimate average snowpack density by means of a multiple linear equation. The in situ data equation predicted density with a correlation (r2) of 0.79 and a standard error of 0.027 gm cm-3. The data from LANDSAT-1 were not as significant in a similar equation, possibly because of the large field of view. (Forest Service)
W76-12167

O18/O16 ABUNDANCE VARIATIONS IN SIERRA NEVADA SEASONAL SNOWPACKS AND THEIR USE IN HYDROLOGICAL RESEARCH,
Calgary Univ. (Alberta). Dept. of Physics.
H. R. Krouse, and J. L. Smith.
In. Proceedings International Hydrolic Decade Snow and Ice, Banff, Canda, September 1972, p 24-38, 1973. 6 fig, 11 ref.

Descriptors: *Snowpacks, Snow management, Snowmelt, *Tracers, *California, Water supply, Ice, *Radioisotopes, *Oxygen isotopes, Isotope studies.
Identifiers: *Sierra Nevada(Calif).

In addition to other parameters, O18/O16 abundances were determined for new fallen snow and snowpacks at 1900 m elevation in the central Sierra Nevadas of California during storms in the winters of 1965-68. The O18 values ranged from -5 to -26 0/00 SMOW (Standard Mean Ocean Water). Isotopic minima that have been identified with the coldest winter precipitations in other studies were not discernible. Isotopic compositions were not determined solely by temperature but depended upon other factors such as wind direction. The isotopic composition of individual layers changed markedly as melt water moved through the pack. These changes were related to hydrologic processes such as ice granule formation and water absorption by individual snow layers. No relation was found between snow density and isotope composition. It is concluded that when ice layers are formed under topographic and atmospheric conditions typical of this area, the identification of seasonal trends in glaciers is extremely difficult and subject to misinterpretation. (Forest Service)
W76-12169

WATER YIELD IMPROVEMENT RESEARCH OF THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION AND ITS USEFULNESS TO WILDLAND RESOURCE MANAGEMENT,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-12170

THE CHEMISTRY OF 700 YEARS OF PRECIPITATION AT DYE 3, GREENLAND,
Army Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 5A.
W76-12181

ICE THICKNESS OBSERVATIONS, NORTH AMERICAN ARCTIC AND SUBARCTIC, 1970-71, 1971-72,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
M. A. Bilello, and R. E. Bates.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 329, $5.50 in paper copy, $3.00 in microfiche. Special Report 43, Pt. VII, April 1975. 103 p, 7 fig, 6 tab, 8 ref.

Descriptors: *Ice, *Arctic, *Subarctic, *Alaska, *Canada, Cold regions, Ice cover, Lake ice, Rivers, Sea ice, Winter, Measurement, Surveys, Data collections.
Identifiers: *Ice thickness.

This seventh in a series of reports on lake and river ice and land-fast sea ice presented ice thickness measurements observed throughout the North American Arctic and subarctic during the 1970-71 and 1971-72 winter seasons. Information on surface ice conditions, dates of first ice, freeze-over and breakup, and detailed measurements of ice thickness across Alaskan rivers were also included. Some reports from the Alaska National Guard network on ice thickness measurements in remote areas of western Alaska were also presented. Analyses were made of maximum observed ice thicknesses reported during the two winters, and deviations from the mean ice thickness measured across rivers and creeks in southeast Alaska between 1965 and 1972. A tabulation of the dates when maximum ice was observed at 25 locations in Alaska, 44 in Canada, and 1 in Greenland during each year from 1961 to 1972 was also given. Computations of the average annual date of maximum ice at all the stations and an isoline map showing the results for northern North America was presented. (Sims - ISWS)
W76-12182

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
For primary bibliographic entry see Field 2L.
W76-12200

SHADOW LENGTH TABLES FOR ENVIRONMENTAL PLANNING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12240

CONTROLLING SOLAR LIGHT AND HEAT IN A FOREST BY MANAGING SHADOW SOURCES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12241

SHADOW LENGTH TABLES FOR LATITUDE 42 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12242

SHADOW LENGTH TABLES FOR LATITUDE 50 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12243

SHADOW LENGTH TABLES FOR LATITUDE 44 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12244

SHADOW LENGTH TABLES FOR LATITUDE 46 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12245

SHADOW LENGTH TABLES FOR LATITUDE 48 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12246

SHADOW LENGTH TABLES FOR LATITUDE 38 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12247

SHADOW LENGTH TABLES FOR LATITUDE 40 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12248

SHADOW LENGTH TABLES FOR LATITUDE 36 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12249

FIELD DETERMINATION OF THE DENSITIES OF LAKE ICE SHEETS,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
W. P. Adams.
Limnology and Oceanography, Vol. 21, No. 4, p 602-608, July 1976. 3 fig, 2 tab, 12 ref.

Descriptors: *Ice, *Lake ice, *Density, *Canada, *Lakes, Surveys, On-site investigations, Snow cover, Ice cover, Buoyancy, Measurement, Equations, Winter.
Identifiers: *Ice density, *Gillies Lake(Ontario), *Knob Lake(Ontario).

A method of calculating the mean density for a lake ice sheet and estimating the mean density of the white ice component of such a sheet made use of the buoyancy equation for floating ice. The equation related the density of the ice to the mean density and thickness of water and snow, and the thickness of the ice. The technique required the measurement of snow density on the lake. Mean ice sheet densities of 0.89 and 0.85 g/cu cm and mean white ice densities of 0.84-0.87 were reported from two lakes. (Sims - ISWS)
W76-12429

A SNOWMELT RUNOFF MODEL AND ITS APPLICATION TO SHORT-RANGE FORECASTING OF FLOOD DISCHARGES,
Hydrometeorological Service of the USSR, Moscow.
A. P. Zhidikov, A. G. Levin, N. S. Nechaeva, and E. G. Popov.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 195-202, March 1976. 2 fig, 8 ref.

Descriptors: *Snowmelt, *Runoff, *Model studies, *Forecasting, Mathematical models, Floods, Equations, Rivers, Flow, Precipitation(Atmospheric), Snowfall, Snow cover, Watersheds(Basins), Discharge(Water), Hydrographs, Spring, Seasonal, Reservoirs, Water resources.
Identifiers: *USSR, *Volga River(USSR), Short-range forecasting, Spring flood.

A snowmelt runoff model was derived for relatively small rivers. The model involved the main components of the catchment water budget, physiographical and some other factors: water equivalent of snow cover, precipitation, antecendent moisture content, daily snowmelt, non-uniformity of snow cover, retention capacity of the basin, and percentage of forest area. The model structure included calculations of the daily values of snowmelt excess and the transformation of these values into discharges at the outlet of the basin based on meteorological observations and appropriate distribution functions. Both calculations were made separately for open and forest areas. The parameters of the model were derived by optimization methods. The linear model based on the superposition principle was used to transform the discharges of a small river into total inflow into a large reservoir. The combined model was used to forecast for five days in advance daily mean inflows into the Gorky and Kuibyshev reservoirs (on the River Volga), using the observed and forecast discharges of the small rivers as input. (Sims-ISWS)
W76-12440

OXYGEN ISOTOPE STUDIES ON SEA ICE IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
F. C. Tan, and W. D. Fraser.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 6, p 1397-1401, June 1976. 1 fig, 1 tab, 9 ref.

Descriptors: *Oxygen isotopes, *St. Lawrence Seaway, *Isotope studies, *Oxygen, *Radioisotopes, *Isotope fractionation, Analytical techniques, Water properties, *Sea ice, Sea water, Gulfs, Analysis, Chemistry, Radiochemical analysis, Oceans, Instrumentation, Salinity, Distillation.
Identifiers: *Oxygen isotope studies, *Gulf of St. Lawrence, *Isotopic enrichment, St. Lawrence estuary, Ice core studies, Enriched ice, Enriched snow, Ice cores, Slush ice, Surface seawater, Analytical procedures.

The fractionation of oxygen isotopes between sea ice and sea water in samples collected from the Gulf of St. Lawrence indicated that sea ice is enriched in its 018:016 ratio with respect to coexisting sea water. It was observed that sources of sea ice in the Gulf of St. Lawrence may be identified on the basis of 018:016 measurements. (Henley - ISWS)
W76-12448

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
For primary bibliographic entry see Field 2G.
W76-12451

PAVEMENT CRACKING IN WEST TEXAS DUE TO FREEZE-THAW CYCLING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
S. H. Carpenter, R. L. Lytton, and J. A. Epps.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 1-13, 1975. 12 fig, 1 tab, 22 ref.

Descriptors: *Highways, *Freezing, *Thawing, *Texas, Roads, Road construction, Paving, Highway icing, Salts, Laboratory tests, Finite element analysis, Temperature, Moisture content, Civil engineering, Freeze-thaw tests.
Identifiers: West Texas, *Pavement cracking, Freeze-thaw cycling, Pavements, Soil suction, Biaxial freezing.

Freeze-thaw contraction of the base course material used in west Texas is considered an important element in pavement deterioration. Sam-

ples from two compactive efforts were frozen in a biaxial closed system. Suction and temperature within the samples were monitored and volume changes after each freeze-thaw period were recorded. Coefficients of thermal activity were calculated from the dimension measurements. These coefficients showed a relationship with the as-compacted total soil moisture suction, which was similar for all materials. Finite element studies of the thermal strains that develop in a typical pavement showed that the thermally induced tensile stresses in the base course are far in excess of typical tensile strengths for initially intact pavements. The surface course did not develop excessive stress levels. Freeze-thaw cycling produced plastic deformations in all samples, and the permanent expansion or contraction was related to the as-compacted total soil moisture suction. These permanent deformations from freeze-thaw cycling imparted a residual tensile stress to the asphalt concrete. During a freeze, the suction in the sample showed a marked increase, often 10 to 20 times the initial value. The suction then dropped below the initial value during the thaw cycle. This drop was consistent regardless of the thermal activity or plastic deformation. This indicated a reorganization of the moisture in the sample, which may be related to strength losses caused by freeze-thaw cycling. The data in this study gave new insight into the mechanism of freeze-thaw in pavement deterioration. (See also W76-12451) (Sims - ISWS)
W76-12452

ENGINEERING PROPERTIES OF COMPACTED CLAY CONDITIONED BY SATURATION AND FREEZE-THAW CYCLES,
Mobil Research and Development Corp., Dallas, Tex.
C. A. Pagen, and V. K. Khosla.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 14-29, 1975. 14 fig, 2 tab, 18 ref.

Descriptors: *Highways, *Compacted soils, *Saturated soils, *Freezing, Thawing, Saturation, Clays, Soils, Roads, Road construction, Paving, Laboratory tests, Strength of materials, Temperature, Moisture content, Subsurface drainage, Civil engineering.
Identifiers: *Freeze-thaw cycling, Pavements, Subgrade drainage.

This research quantitatively evaluated the effect of saturation and freeze-thaw cycles on the rheological characteristics of a compacted subgrade. Kaolin samples compacted by 25, 40, and 80 blows of a drop hammer were tested over a wide range of moisture contents and densities. The failure and rheological parameters investigated that relate to soil strength are unconfined compressive strength, modulus of elasticity, creep modulus, and complex elastic modulus. Laboratory compacted samples were saturated under controlled boundary stress conditions in a specially designed chamber and were then subjected to nine freeze-thaw cycles before testing. Results showed that volumetric swelling, although less than the volume of absorbed water, increases as compaction energy increases and that soil structure also changes under saturation and freeze-thaw cycles. Rheological parameter values seemed to be independent of the compaction energy levels used. Results also showed that compacted cohesive subgrades exposed to saturation and freeze-thaw cycles in the field will experience major reductions in load-carrying capacity. Therefore, it is recommended that the design of rigid and flexible pavements over cohesive subgrades for areas in which cyclic freezing and thawing occurs should focus greater attention on providing adequate subgrade drainage so that initial saturation of the subgrade is minimized. (See also W76-12451) (Sims - ISWS)
W76-12453

CASE STUDIES OF VARIATIONS IN SUBGRADE MOISTURE AND TEMPERATURE UNDER ROAD PAVEMENTS IN VIRGINIA,
Virginia Highway and Transportation Research Council, Charlottesville.
N. K. Vaswani.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 30-42, 1975. 13 fig, 1 tab.

Descriptors: *Roads, *Moisture content, *Temperature, *Subsoil, *Virginia, Precipitation(Atmospheric), Highways, Road construction, Soils, Underground, Soil moisture, Strength of materials, Freezing, Subsurface drainage, Paving, Civil engineering.
Identifiers: Subgrades, Subgrade drainage, Pavements.

Changes in moisture under uncovered ground and in the subgrades of pavements were evaluated. The pavements ranged from new to about 10 years old. Moisture content was determined by a nuclear probe to determine moisture depth. The findings were as follows: (1) the higher the compaction and dry density of the subgrade soil were, the lower the moisture content would be; (2) subgrade moisture content increased sharply from the beginning to the end of construction; (3) for 1 or 2 years from the date of the subgrade construction, moisture content increased because of precipitation and after this time the rate of increase in moisture decreased; and (4) after about 10 years there was little increase in the subgrade moisture content. (See also W76-12451) (Sims - ISWS)
W76-12454

SATELLITE SNOW OBSERVATIONS AND SEASONAL STREAMFLOW FORECASTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
A. Rango, and V. V. Salomonson.
Final Report, January 1976, 19 p, 7 fig, 3 tab, 5 ref. NOAA Contract No. NA-776-74.

Descriptors: *Satellites(Artificial), Meteorology, *Remote sensing, Snow, *Snow cover, *Snowmelt, Streamflow, *Streamflow forecasting, Asia, Wyoming.
Identifiers: Satellite observations, Environmental satellite observations, Earth resources satellite observations, *Snow observations, *Indus River Basin(India), *Wind River Mountains(Wyo).

Relatively low spatial resolution (about 4 km) environmental satellite and high spatial resolution (80m) earth resources satellite data have been used to map snow-covered areas in the upper Indus River Basin in Pakistan and the Wind River Mountains in Wyoming. For the Indus River, early Spring snowcovered area measurements were obtained and compared to April through June total streamflow during the years 1967-1971. A linear regression equation quantitatively expressing the relationship had an r2 = 0.91. Prediction of the April-June 1972 streamflow using this equation produced an estimate that was within three percent of the actual total. Composited results from two years of data over seven Wind River Mountain watersheds indicated that Landsat-1 snow-cover observations, separated on the basis of watershed mean elevation, were also related to seasonal runoff as expressed in the form of statistically significant regression equations. These results indicate that satellite-derived snow-covered area has the potential for becoming a useful input parameter for improved prediction of snowmelt runoff. (NOAA)
W76-12468

SOME REMARKS ON THE UNUSUAL BEAUFORT SEA ICE CONDITIONS IN SUMMER 1975,
Alaska Univ., College. Geophysical Inst.
G. Wendler, and K. O. L. F. Jayaweera.
SG Report No. 76-7, Geophysical Inst. No. UAG R-246, May 1976. 28 p, 14 fig, 1 tab, 29 ref. SG No. 04-6-158-44039.

Descriptors: Weather, *Weather data, Ice, *Ice cover, *Sea ice, *Alaska, Arctic, Arctic Ocean, Sea water.
Identifiers: *Sea ice movement, *Ice thickness, Prudhoe Bay(Alas), *Beaufort Sea(Alas).

In the summer of 1975 the sea ice conditions between Point Barrow and Prudhoe Bay were the severest since 1898 when the ice did not move away from shore at all. In 1975 the movement started later than in any year since that time and was incomplete. From the meteorological point of view this event is very interesting and also had great economic ramifications because the need to resupply the Prudhoe Bay oil fields by barges could not be carried out as planned. These unusual ice conditions were caused by: (a) a thicker than normal ice cover for the winter of 1974-75 owing to a cold and snow-deficient winter; (b) a cooler than normal summer 1975 which not only slowed down the rate of ice decay but also shortened the period in which melting occurred, and (c) the unusual wind conditions in summer 1975 which were caused by a persistent low pressure system over the high Canadian Arctic for July, August, and September, adding a northwesterly wind component to the average wind which kept the ice near to shore. The last reason is believed to be the most important. (NOAA)
W76-12470

WINDBREAKS MAY INCREASE WATER YIELD FROM THE GRASSLAND ISLANDS IN ARIZONA'S MIXED CONIFER FORESTS,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-12477

2D. Evaporation and Transpiration

SEASONAL SNOW SURFACE ENERGY BALANCE IN A FOREST OPENING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12160

WATER BALANCE IN UGANDA,
Makerere Univ., Kampala (Uganda). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W76-12204

FOREST SOILS AND THE ASSOCIATED SOIL-PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-12239

ESTIMATING GROUNDWATER EVAPOTRANSPIRATION FROM STREAMFLOW RECORDS,
Geological Survey, Doraville, Ga.
J. F. Daniel.
Water Resources Research, Vol 12, No 3, p 360-364, June 1976. 5 fig, 10 ref.

Descriptors: *Evapotranspiration, *Groundwater, *Estimating, *Model studies, *Streamflow, Flow rates, Aquifer characteristics, Transmissivity, Surface-groundwater relationships, Hydrologic data, *Alabama.
Identifiers: *Indian Creek(Ala).

An analytical solution for the evapotranspiration rate from the aquifer system of a stream basin was applied to a selected basin despite large-scale violations of assumptions for the derivation. Rates computed represent losses from the groundwater bodies and do not include losses from soil moisture. The computed rate for the 23.00 sq km basin, Indian Creek near Troy, Alabama, during April and May 1963 was 0.037 cu m/sec, or about 0.5 cm/month. Such results should be reliable enough to use in rainfall-runoff models and, in the absence of more detailed data, in areal groundwater models. (Woodard-USGS)
W76-12285

2E. Streamflow and Runoff

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST SERVICES IN THE CONNECTICUT RIVER BASIN,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W76-12186

A METHOD OF FINDING THE FAMILY OF RUNHYDROGRAPHS FOR GIVEN RETURN PERIODS,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
L. A. V. Hiemstra, W. S. Zucchini, and G. G. S. Pegram.
Journal of Hydrology, Vol. 30, No. 1/2, p 95-103, May 1976. 6 fig, 5 ref.

Descriptors: *Hydrographs, *Hydrograph analysis, *Peak discharge, *Flood frequency, *Flow rates, Frequency analysis, Runoff, Hydrology, Design flood.
Identifiers: *Runhydrographs, *Vaal River(South Africa), *South Africa, Lognormal probability distribution, Return period, Exceedance probability, Run-theory.

Most observed flood hydrographs at a problem point are composite hydrographs. Expotential function describe both the rising and recession limbs of averaged composite hydrographs very well. These averaged composite hydrographs are called run-hydrographs because run-theory was used in the averaging process. A log transformation results in triangular shapes for runhydrographs. Runhydrographs are therefore fully defined in terms of times-to-peak and peak rates of runoff measured on and from a selected horizontal truncation level, respectively. A bivariate lognormal probability distribution for times-to-peak and peak rates of runoff is a satisfactory descriptor for the occurrence of runhydrographs. Parameters were estimated from 50 years of continuous instantaneous hydrograph record for the Vaal River at Standerton. Contours of equal probability of exceedance were calculated from the bivariate lognormal probability distribution which enables the extraction of a family of runhydrographs for any desired probability of exceedance. This capability enables the civil engineer to select the members of this family of most interest to his flood problem. (Lardner - ISWS)
W76-12195

DERIVATION OF TIME OF CONCENTRATION,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol. 30, No. 1/2, p 147-165, May 1976. 4 fig, 8 ref.

Descriptors: *Time of concentration, *Runoff, *Precipitation intensity, *Watersheds(Basins), Continuity equation, Momentum equation, Equilibrium, Hydrology, Equations, Mathematical studies, Rainfall, Time.
Identifiers: *Space-time distribution, *Kinematic wave equation, Watershed characteristics, Method of characteristics, Plane sections, Converging sections.

Generalized expressions for the time of concentration are derived from the kinematic wave theory. Two types of geometric configurations are considered in the derivations: (1) rectangular plane section and (2) converging section. It was shown that under very special conditions the well-known Kirpich's formula for the time of concentration is a special case of the generalized expressions. Furthermore, it was shown that the rainfall duration has definite influence on the time of concentration - a fact that apparently has not been considered before. (Lardner - ISWS)
W76-12196

DISCHARGE PREDICTION, PRESENT AND FORMER, FROM CHANNEL DIMENSIONS,
Wisconsin Univ., Madison. Dept. of Geography.
G. H. Dury.
Journal of Hydrology, Vol. 30, No. 3, p 219-245, July 1976. 6 fig, 3 tab, 37 ref.

Descriptors: *Discharge(Water), *Channel flow, *Channels, Streams, Valleys, Velocity, Humid areas, Slopes, Beds, Meanders, Equations.
Identifiers: *Discharge prediction, *Channel dimensions, Underfit streams, Valley meanders, Empirical study, Power-functions, Slope factor, Bedwidth, Meander wavelength.

Discharge at the most probable annual flood can be predicted from the dimensions (including slope) of existing stream channels. The predicting technique was modified for application to former channels, all of which were considered unbraided. The analysis of formerly available data plus new data on bedwidth, meander wavelength, channel slope and discharge, in some cases, provided empirical confirmation of the theoretical relationships of channel to discharge, and in other cases produced results fully consonant with those relationships. Analysis confirmed a linear relationship, that extended through flume observations, between meander wavelength and discharge. Analysis also permitted the identification of stereotype numerical constants for use in the equations relating width, depth, velocity, slope, roughness and wavelength to the discharge of streams in humid regions. Allowance for cross-sectional area and channel slope resulted in a predicting equation that, tested against channels which discharge 395 cu m/s or less at the most probable annual flood, was highly successful in predicting for channels that carried 11,500 and 283,170 cu m/s at the same frequency. (Roberts - ISWS)
W76-12198

INCREASING THE MEAN CURRENT IN COASTAL CHANNELS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2L.
W76-12201

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12280

FLOOD DISCHARGE OF STREAMS IN NEW MEXICO AS RELATED TO CHANNEL GEOMETRY,
Geological Survey, Albuquerque, N. Mex.
A. G. Scott, and J. L. Kunkler.
Open-file report 76-414 June 1976. 29 p, 6 fig, 3 tab, 18 ref.

Descriptors: *Flood discharge, *Streams, *New Mexico, *Flood recurrence interval, *Flood forecasting, Flow rates, Gaging stations, Channel morphology, Hydrologic data, Evaluation.
Identifiers: Log-Pearson Type III.

Results are described of a study relating flood characteristics to the reference width of the channel. Data from 79 gaging stations were used in these analyses. Stations were selected which would provide estimates of floods of a 10-year recurrence interval and at which channel-geometry could be adequately measured in the field. The discharges for recurrence intervals of 2, 5, 10, 25 and 50 years were determined for each station by the log-Pearson Type III method. The relation between the magnitude of floods of various frequencies and the reference width and main-channel slope was reliable with a standard error of about 65 percent for most of the areas of the State. (Woodard-USGS)
W76-12294

A SNOWMELT RUNOFF MODEL AND ITS APPLICATION TO SHORT-RANGE FORECASTING OF FLOOD DISCHARGES,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2C.
W76-12440

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-12442

2F. Groundwater

ON THE GENERAL EQUATIONS FOR FLOW IN POROUS MEDIA AND THEIR REDUCTION TO DARCY'S LAW,
Princeton Univ., N. J. Dept. of Civil Engineering.
W. G. Gray, and K. O'Neill.
Water Resources Research, Vol. 12, No. 2, p 148-154, April 1976. 1 fig, 15 ref, append. NSF ENG75-16072 and NSF-RANN 6064.

Descriptors: *Groundwater, Equations, *Darcys law, Mathematics, *Flow, Subsurface waters, Groundwater movement, Groundwater potential, Pore water, Energy equation, Momentum equation, Mathematical studies, *Porous media, Mass transfer, Convection, Dispersion.
Identifiers: *Equations of flow, *Newtonian fluid, General equations, *Isotropic media, Inertia.

A technique of local averaging was applied to obtain general equations which describe mass and momentum transport in porous media. The averaging was performed without significantly idealizing either the porous medium or the pertinent fluid mechanical relations. The resulting general flow equation was simplified to treat flow of a Newtonian fluid in a slowly deforming solid matrix for two special cases. For flow in an isotropic medium where convective and inertial terms are important, an equation was developed which is dependent only on five medium parameters which could be evaluated by experiment. Flow in an anisotropic medium was also analyzed, and the general equation was reduced to Darcy's law when the convective and inertial terms were neglected. (Prickett - ISWS)
W76-12199

HYDRODYNAMICS OF GROUNDWATER FLOW IN A FRACTURED FORMATION,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Water Resources Research, Vol. 12, No. 3, p 405-414, June 1976. 9 fig, 3 tab, 31 ref, 1 append.

Descriptors: *Groundwater movement, *Hydrodynamics, *Equations, *Fractures(Geologic), Hydraulic properties, Aquifers, Aquitards, Elasticity(Mechanical), Homogeneity, Heterogeneity, Drawdown, Testing, Pumping, Porous media, Fissures(Geologic), Graphical analysis, Mathematical studies, Rock properties.
Identifiers: *Fissure flow, *Pore flow, Recovery, Type curves.

Hydrodynamical aspects of groundwater flow in fractured formations and the basic hydraulic properties controlling the flow were considered. A brief literature survey on studying the physical characteristic of the fractured rocks and on developing an understanding on the mechanism of fluid flow in fracture formations constituted an introductory section. Basic definitions, relations, and assumptions given for subsequent interpretation of the flow behavior in a fissured rock then followed. Concepts of fractured, homogeneous, and heterogeneous water-bearing formations and their response mechanism to a pressure change were considered. The general differential equations for a flow in a fractured and in a heterogeneous formation of uniform anisotropy were derived. Two types of the flow behavior, fissure flow and pore flow, were distinguished. Two drawdown equations, respectively, for a flow in a fissure space, whether void or infilled with a fine material, and for a flow in a porous space to a well discharging at a constant rate in a fractured aquifer, were given. A fractured reservoir response to a pressure change due to pumping was illustrated by the field drawdown and recovery data. A particular case of a heterogeneous formation, an aquifer-aquitard system, was discussed, and the drawdown distribution in both aquifer and aquitard was given when account is taken of their elastic properties. (Visocky - ISWS)
W76-12207

DIGITAL MODEL TO PREDICT EFFECTS OF PUMPING FROM THE ARIKAREE AQUIFER IN THE DWYER AREA, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W76-12277

THE SHALLOW AQUIFER--A PRIME FRESHWATER RESOURCE IN EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. G. Rodis, and L. F. Land.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-254 393, $3.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-21, February 1976. 12 p, 6 fig, 4 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, Hydrologic data, Groundwater movement, Water table, Water levels, Saline water intrusion.
Identifiers: Eastern Palm Beach County(Fla).

The shallow aquifer underlies all of Palm Beach County, Fla., and is the source of almost all freshwater supplies in the eastern part of the county. It consists of mixtures of sand, shell sandstone, and limestone. In this area the concentration of dissolved solids in the ground water usually does not exceed 500 milligrams per liter. A section of cavity-riddled limestone and other permeable rocks is located several miles inland and extends north to south almost the entire length of the county. This section yields up to 2,000 gallons per minute of water to large wells and offers an excellent potential for the development of future ground water supplies. Sea-water intrusion into the shallow aquifer is a potential threat to several coastal well fields. The wells nearest the coast are most vulnerable. (Woodard-USGS)
W76-12278

AVAILABILITY OF GROUND WATER NEAR CARMEL, HAMILTON AND MARION COUNTIES, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 6A.
W76-12287

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
G. A. Miller.
Open-file report 76-138, April 1976. 78 p, 25 fig, 12 tab, 61 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Groundwater recharge, *Water quality, Water utilization, Hydrologic data, Data collections, Pumping, Water wells, Irrigation, Surface-groundwater relationships, Hydrogeology, Water level fluctuations, Chemical analysis, *California.
Identifiers: Lompoc area(Calif), Santa Barbara County.

Water supplies in the Lompoc plain in Santa Barbara County, Calif., are pumped from highly permeable gravel and sand, which make up the main water-bearing zone. The history of groundwater quality in the Lompoc area shows little change in the Lompoc upland and the Lompoc terrace, but an increase in the concentration of dissolved solids in the main water-bearing zone beneath the Lompoc plain. Most water pumped from this zone is used for irrigation and contains dissolved solids in concentrations ranging from less than 500 to more than 3,000 milligrams per liter (mg/liter). The average concentration is about 1,500 mg/liter. The total hardness is more than 1,000 mg/liter, and most of this water contains more than 750 mg/liter sulfate; the most abundant ions are calcium, sodium, sulfate, and bicarbonate. Changes in ground-water quality seem largely related to irrigation return; to inflow of native water of poor quality; to discharge of sewage effluent; and, in the shallow water-bearing zone, perhaps to the oxidation of sulfide minerals. Average annual recharge to ground water in the plain from the Santa Ynez River, local tributaries, underflow, and infiltration of rain is about 14,000 acre-ft. Discharge of ground water from the Lompoc plain is by pumping, evapotranspiration, streamflow, and underflow to the ocean. Pumpage during 1972 was about 23,000 acre-ft, less than half of which probably returned to the main water-bearing zone. (Woodard-USGS)
W76-12288

A NOTE ON COMPUTING FINITE DIFFERENCE INTERBLOCK TRANSMISSIVITIES,
Geological Survey, Reston, Va.
C. A. Appel.
Water Resources Research, Vol 12, No 3, p 561-563, June 1976. 2 fig, 5 ref.

Descriptors: *Transmissivity, *Aquifers, *Equations, *Hydrogeology, *Aquifer characteristics, Flow rates, Steady flow, Methodology.
Identifiers: *Interblock transmissivities.

An expression is presented for the interblock transmissivity that gives the exact flow rate at steady state for the case where the aquifer transmissivity is a linear function between block centers. This formulation would be preferred for cases where the areal variation in transmissivity is gradual rather than abrupt. (Woodard-USGS)
W76-12292

DEVELOPING A STATE WATER PLAN: GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-12296

WATER-LEVEL CHANGES IN SOUTHWESTERN KANSAS, 1940-75,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12297

GROUND-WATER RESOURCES OF LANE AND SCOTT COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12298

A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer, and R. C. Rice.
Water Resources Research, Vol. 12, No. 3, p 423-428, June 1976. 4 fig, 11 ref.

Descriptors: *Hydraulic conductivity, *Aquifer testing, *Aquifers, *Water wells, *Thiems equation, Water levels, Resistance networks, Analog models, Equations, Transmissivity, Water table aquifers, Water table, Potentiometric level, Permeability, Equilibrium.
Identifiers: *Slug test, Effective radius, Partial penetration, Equipotentials.

A procedure was presented for calculating the hydraulic conductivity of an aquifer near a well from the rate of rise of the water level in the well after a certain volume of water is suddenly removed. The calculation was based on the Thiem equation of steady state flow to a well. The effective radius R sub e over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated was evaluated with a resistance network analog for a wide range of system geometries. An empirical equation relating R sub e to the geometry of the well and aquifer was derived. It was discovered that the technique is applicable to completely or partially penetrating wells in unconfined aquifers; it can also be used for confined aquifers that receive water from the upper confining layer. The method's results were compatible with those obtained by other techniques for overlapping geometries. (Visocky - ISWS)
W76-12432

UNSTEADY FLOW TO A NONPENETRATING ARTESIAN WELL,
Singapore Univ. Dept. of Civil Engineering.
M. H. A. Khader, and D. Ramadurgaiah.
Ground Water, Vol. 14, No. 4, p 200-204, July-August 1976. 5 fig, 2 tab, 9 ref.

Descriptors: *Groundwater, *Artesian aquifers, *Water wells, *Drawdown, *Penetration, Equations, Mathematical studies, Unsteady flow, Steady flow, Aquifer testing, Groundwater movement, Wells.
Identifiers: *Nonpenetrating artesian wells, *Leaky artesian conditions, Type curves, Finite well diameter, *Laplace transformations, Response curves.

Exact solution to the problem of unsteady drawdown in a leaky artesian aquifer due to a constant discharge nonpenetrating well was presented. Finiteness of the well radius and aquifer anisotropy were considered in formulating the problem. The solution was derived on the assumption that the flux entering the pumped well was uniformly distributed over the plane circular bottom of the well. The aquifer was considered to be finite in thickness, but of infinite lateral extent. The flow of groundwater was assumed to be governed by Jacob's model of linear leakage. The Laplace transformation technique was employed in the theoretical development. The drawdown function was numerically integrated in terms of

dimensionless parameters of the flow system and the results were depicted in graphs. (Prickett-ISWS)
W76-12445

ANALYTIC SOLUTIONS FOR DETERMINING NATURALLY FRACTURED RESERVOIR PROPERTIES BY WELL TESTING,
Instituto Mexicano del Petroleo, Mexico City.
For primary bibliographic entry see Field 8B.
W76-12449

INTERPRETATION OF IN SITU PERMEABILITY TESTS ON ANISOTROPIC DEPOSITS,
Birmingham Univ. (England).
For primary bibliographic entry see Field 2G.
W76-12455

INVESTIGATION OF FILTRATION CHARACTERISTICS OF A NONWOVEN FABRIC FILTER,
Marks-Rosen, Inc., Knoxville, Tenn.
For primary bibliographic entry see Field 2G.
W76-12459

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
C. O. Pollard, S. A. Mulaik, and W. S. Parks, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 839, $5.00 in paper copy, $3.00 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC-0676, July 1976, 88 p, 16 ref, 16 append. OWRT A-063-GA(1). 14-31-0001-5010.

Descriptors: *Groundwater, *Georgia, Coastal plains, Water quality, Water chemistry, Acquifer characteristics, Geochemistry, Chemical analysis, Water analysis, Water wells, Silica, Hydrogen ion concentration, Fluorides, Brines, Limestone.
Identifiers: *Multivariate analysis, Cluster analysis, Factor analysis, Evaporites.

Chemical analyses of groundwaters from 589 Georgia Coastal Plain wells were cluster-analyzed (both hierarchically and non-hierarchically) using the major elements, depth, and locations as the 14 variables that had been measured on each well. Hierarchical clustering produced the most meaningful classification of these groundwaters, in that most of the 17 clusters obtained were restricted geographically and the geologic ages of the producing horizons were also somewhat restricted to known continuous aquifers. Discriminant analysis of the clustered data yielded discriminant functions for the classification of future wells and a ranking of the variables in terms of importance for distinguishing among clusters, SiO2, pH, and F were the three most important chemical variables in this respect, and Cl and Na were the least important. Factor analysis of the clustered data revealed source variables (brine, limestone, evaporites, etc.) that account for observed correlated variations in the chemical analyses. Most of the waters appear to have equilibrated with their surroundings to the extent that they now identify their surroundings. The brine-contaminated waters found in the coastal area were identified and were split into levels of contamination. Timely and useful information about critical interactions within Georgia groundwaters was gained from available somewhat incomplete, data without the delays and expenses required for traditional hydrologic and geologic studies. The study has defined characteristics of waters in the clusters and the natural factors that affect those characteristics, both of which can be used as background for comparison of future environmental impacts and for predictions of effects of proposed groundwater recharge and coolant wells.
W76-12466

2G. Water In Soils

PEAT TEMPERATURE REGIME OF A MINNESOTA BOG AND THE EFFECT OF CANOPY REMOVAL,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
J. M. Brown.
Journal of Applied Ecology, Vol. 13, p. 189-194, April 1976. 1 fig, 2 tab, 8 ref.

Descriptors: *Peat, *Bogs, Organic soils, *Soil temperature, *Water temperature, *Minnesota, *Climatology, Clear-cutting, Canopy, Streamflow, Water table.
Identifiers: Black spruce trees, Forested strips, *Peat temperature.

Temperatures, at four depths, were routinely measured in a strip-cut black spruce bog to determine the peat temperature regime and the effect of canopy removal. Peat temperatures were unaffected by removal of the canopy. Peat temperatures near the surface were closely correlated to climatic conditions while temperatures at a depth of 2 meters lagged several months behind the climatic regime. Outlet stream temperatures showed that streamflow originates primarily from the upper surface of the bog water table. (Forest Service)
W76-12174

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12188

FOREST SOILS AND THE ASSOCIATED SOIL-PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith.
In: Isotopes and radiation of soil-plant relationships, including forestry, International Atomic Energy Agency, Vienna, Austria, p 399-412, 1972. 4 tab, 19 ref. Paper IAAE-SM-151/37.

Descriptors: Radioisotopes, *Soil water movement, Soil-water-plant relationships, *Tracers, *Pinus contorta, Transpiration, *Red fir trees, *Lodgepole pine trees, *Water budget, *Forest soils, Soil moisture, California.

In forest lands, maximum stream discharges, peak flows, soil erosion, plant growth and water yield improvement through vegetation change depend on the hydrologic regime of the soil. The use of radioactive isotopes has made it easier to trace water movement in soils and trees. The technique was used to measure water movement in soils on the Sierra Nevada of California and in two major tree species--red fir (Abies magnifica A. Murr.) and lodgepole pine (Pinus contorta Dougl.) - growing there. Water flow through a pyroclastic soil having porosities of 44 to 61% was traced by tritium and 32P. Water movement in these tree species in early spring when the soil was covered to a depth of 360 cm of snow ranged from 1.5 to 2m/h. Evapotranspiration could not be determined by measuring soil moisture because snowmelt quickly replenished soil moisture. Total water use by lodgepole pine was estimated by combining rates and area of water movement within tree stems. Estimates of water use ranged from 0.1 litre/h for long-term movement in winter to 30.6 litre/h for short-term movement in early spring during ideal transpiration conditions. The results suggest that coefficients for water balance formula based on the energy balance approach can be estimated by using data on water movement determined by isotope tracers. (Forest Service)
W76-12239

FUNDAMENTAL STUDIES ON RESIDUE AND MOVEMENT OF FORESTRY HERBICIDES IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
For primary bibliographic entry see Field 5B.
W76-12263

ANIMAL WASTE AND NITRATE MOVEMENT THROUGH SOIL,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-12362

FUNDAMENTALS OF PROGRAMMED SOIL MOISTURE DEPLETION,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
For primary bibliographic entry see Field 3F.
W76-12373

ANALYTICAL SOLUTION OF THE EQUATION FOR TRANSPORT OF REACTIVE SOLUTES THROUGH SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim, and R. S. Mansell.
Water Resources Research, Vol. 12, No. 3, p 528-532, June 1976. 3 fig, 18 ref. OWRT A-026-FLA(8).

Descriptors: *Soil water movement, *Solutes, *Analytical techniques, *Soil chemistry, *Leachate, *Adsorption, Aqueous solutions, Soils, Steady flow, Infiltration, Unsteady flow, Laboratory tests, Equations, Mathematical studies, Soil surfaces.
Identifiers: *Solute transport, *Reactive solutes, *Soil columns, *Convective-dispersive equation, Pore velocities.

Mathematical solutions of the differential equation governing reactive solute transport in a finite soil column were developed for two specific cases: continuous solute input and pulse-type solute input at the soil surface. These solutions incorporated reversible linear adsorption as well as irreversible solute adsorption. The irreversible adsorption was expressed by a sink/source term which either may be a constant or may have a concentration-dependent form. The boundary condition used across the surface was that of the third type, which accounted for advection as well as dispersion. To illustrate the significance of using the proper boundary conditions, comparisions were made with two other mathematical solutions. It was concluded that the solution presented was highly useful for low pore flow velocities. For large pore velocities, all three solutions were in agreement. (Prickett - ISWS)
W76-12450

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
Available from the National Technical Information Service, Springfield VA 22161 as PB-243 443, $4.60 in paper copy, $3.00 in microfiche. Transportation Research Record 532, 1975. 105 p.

Descriptors: *Highways, *Road construction, *Moisture content, *Freezing, *Thawing, Roads, Paving, Temperature, Soils, Subsurface drainage, Soil moisture, Soil properties, Soil mechanics, Permeability, Soil water movement, Moisture meters, Instrumentation, Seepage, Erosion, Filters, Groundwater movement, Measurement, Civil engineering.
Identifiers: *Freeze-thaw cycling, *Pavements, Nonwoven fabric filters, Internal erosion, Dispersive clay soils.

The effects of climate and water on roadway design, construction, and performance have always been of the highest importance. Without temperature changes, structural portions of a

roadway would be rather easy to design for anticipated loads as they would be if moisture changes were also not present. Therefore, the information in this RECORD will be of interest to soils and design engineers who are concerned with the performance of the roadway structure under variations of climate, temperature, and moisture. The combined effects of moisture and temperature resulting in frost action are generally considered to be a problem in the northern states, but much evidence has come to light to indicate that some southern states also have their problems. The problems may in fact be amplified by the higher number of freeze-thaw cycles that are encountered. A study of the problems in west Texas showed that a reorientation of particles and structure occurs, which brings about residual tensile stress in the asphalt concrete pavement surface. Another study showed a sharp rise in subgrade moisture during construction and immediately thereafter. The rate of increase decreased and leveled off at about 10 years after construction. The particular care that must be taken to prevent migration of subgrade fines into the permeable base layer was pointed out. The measurement of soil moisture by remote methods is being aided by the development of new measuring devices. A study of the filtration characteristics of one nonwoven fabric filer was presented. All of the papers in this RECORD make contributions toward a solution to the problems of roadway soil moisture and temperature variation. A single solution is not applicable nationwide nor, in most cases, statewide, but engineering judgment based on the continuing development of the state of knowledge will produce the most economic and satisfactory solutions. (See W76-12452 thru W76-12460) (Sims - ISWS)
W76-12451

PAVEMENT CRACKING IN WEST TEXAS DUE TO FREEZE-THAW CYCLING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W76-12452

ENGINEERING PROPERTIES OF COMPACTED CLAY CONDITIONED BY SATURATION AND FREEZE-THAW CYCLES,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 2C.
W76-12453

CASE STUDIES OF VARIATIONS IN SUBGRADE MOISTURE AND TEMPERATURE UNDER ROAD PAVEMENTS IN VIRGINIA,
Virginia Highway and Transportation Research Council, Charlottesville.
For primary bibliographic entry see Field 2C.
W76-12454

INTERPRETATION OF IN SITU PERMEABILITY TESTS ON ANISOTROPIC DEPOSITS,
Birmingham Univ. (England).
C. S. Dunn, and S. S. Razouki.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 43-48, 1975. 3 fig, 9 ref.

Descriptors: *Soils, *Permeability, *Anisotropy, Subsurface drainage, Percolation, Physical properties, Isotropy, Piezometry, Piezometers, Intakes, Laboratory tests, Model studies, Equations, Soil physics, Soil properties, Soil moisture, Soil water movement.
Identifiers: Anisotropic permeability.

To calculate the permeability of a soil from the results of in situ constant- or variable-head tests, one must know the intake factor for the porous tip used. The intake factor for a cylindrical tip of a piezometer is a function of its length and diameter only. No rigorous relationship has yet been derived, but an accurate empirical formula based on the best fit and previously published numerical solutions expresses the intake factor in a dimensionless form as a function of the ratio of the length to diameter of the tip. When tests are carried out in a horizontally bedded cross-anisotropic deposit (e. g., a laminated lacustrine clay), the permeability, calculated by assuming isotropy, will have a value intermediately between the horizontal and vertical permeabilities. If the ratio of these permeabilities is known from laboratory or other tests, a correction factor may be applied to the permeability (assuming isotropy) to determine the coefficients of permeability in the horizontal and vertical directions. The correction factor, which is a function of both the ratio of intake length to intake diameter and the ratio of the coefficient of the permeability in the horizontal position to that in the vertical position, was presented in graphical form to enable quick determination of the directional permeabilities. (See also W76-12451) (Sims - ISWS)
W76-12455

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8F.
W76-12456

CAPACITANCE SENSOR FOR SOIL MOISTURE MEASUREMENT,
State Univ. of New York at Buffalo.
E. T. Selig, D. C. Wobschall, S. Mansukhani, and A. Motiwala.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. c., p 64-76. 1975. 16 fig. 5 ref.

Descriptors: *Soil moisture, *Instrumentation, *Measurement, *Soil moisture meters, Soils, Soil properties, Electrical properties, Electrical conductance, Conductivity, Roads, Road construction, Strength of materials, Moisture meters, Equipment, Soil tests, Soil science, Soil mechanics, Civil engineering.
Identifiers: *Dielectric constant, Capacitance, Subgrade soils.

Moisture content is an important parameter that controls the performance of earth materials. Because satisfactory techniques were not available, this study was undertaken to develop new instrumentation that could be permanently installed in highway substructures for long-term monitoring of moisture content. Moisture content determination requires that the amount of water and the dry weight in a given volume of soil be obtained. This study considered only the amount of water. A concept that involved the relationship between the amount of water in soil and the dielectric constant, an electrical property, was investigated. The electrical capacitance (C) of a pair of electrodes with moist material between them is related to the dielectric constant (K) by C = (ae)K, where a is a constant based on the geometry of the electrodes and e is the permittivity of the vacuum. So that instrumentation problems encountered in the measurement of capacitance and dielectric constant with laboratory methods used in the field could be overcome, the sensor electrodes and soil were incoprorated in the reasonance circuit whose frequency of oscillation is a function of the circuit components. The measured output was the difference between the frequency in soil and in an electronic reference substituted for the soil. The circuit design was first tested with the electrodes forming a container into which soil could be placed. Several configurations of the embedded sensor were designed and tested. The capacitance concept was useful for sensing change in the amount of moisture per unit volume of soil. (See also W76-12451) (Sims-ISWS)
W76-12457

NUCLEAR MAGNETIC RESONANCE SENSORS FOR MOISTURE MEASUREMENT IN ROADWAYS,
Southwest Research Inst., San Antonio, Tex.
G. A. Matzkanin, and C. G. Gardner.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 77-86, 1975. 13 fig, 1 tab, 4 ref.

Descriptors: *Soil moisture, *Instrumentation, *Soil moisture meters, Measurement, Nuclear moisture meters, Moisture meters, Nuclear magnetic resonance, Soils, Highways, Roads, Road construction, Equipment, Soil tests, Soil properties, Civil engineering, Laboratory tests, Equations.
Identifiers: Subgrade soils, Sensor.

The feasibility of practical instrumentation based on the nuclear magnetic resonance method was investigated to address the need for accurate, reliable moisture measurements in highway systems. A prototype of an implantable sensor that uses the pulsed nuclear magnetic resonance spin-echo technique was developed and subjected to laboratory verification. The sensor was 3 by 2 by 2.25 in (7.6 by 5.1 by 5.7 cm) and weighed about 3 lb (1.35 kg). It directly measured the mass of moisture present; to obtain the percentage of moisture required that soil density be determined by an auxiliary method. Experiments with bentonite, silica flour, and topsoil indicated that the sensor operated reliably, with an accuracy of approximately + or - 1% up to 25% moisture, + or - 2% up to 100% moisture, and + or - 4.5% up to 200% moisture. A dependence of sensor response on soil type necessitated calibration for each soil type. Organic matter and dissolved salt did not affect the sensor readings for bentonite, but organic matter had an effect for silica flour. All of the results obtained were qualitatively accounted for in terms of a simple moisture adsorption and bonding model. (See also W76-12451) (Sims-ISWS)
W76-12458

INVESTIGATION OF FILTRATION CHARACTERISTICS OF A NONWOVEN FABRIC FILTER,
Marks-Rosen, Inc., Knoxville, Tenn.
W. J. Rosen, and B. D. Marks.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 87-94, 1975. 6 fig, 2 tab, 7 ref.

Descriptors: *Subsurface drainage, *Filtration, *Filters, *Fabrics, Drainage, Roads, Highways, Road construction, Soils, Soil water, Soil aggregates, Seepage, Erosion, Laboratory tests, Permeability, Hydraulics, Subsurface flow, Subsurface waters.
Identifiers: *Nonwoven fabric filters, Mirafi 140.

The purpose of this study was to investigate the behavior of a nonwoven fabric filter in subdrainage applications. Experiments were restricted to a single fabric, Mirafi 140. Conventional aggregate filters were tested under compatible conditions to provide a basis of performance behavior. Experimental results indicated that the nonwoven fabric provides desirable performance under a relatively wide range of soil conditions. Hypotheses that relate to mechanisms controlling the behavior of the nonwoven fabric in subdrain applications were discussed. These mechanisms were, in turn, related to induced filtration and internal grading of the soil near the soil-fabric contact surface. (See also W76-12451) (Sims-ISWSs)
W76-12459

DETERMINATION OF DISPERSIVE CLAY SOIL ERODIBILITY BY USING A PHYSICAL TEST,
Texas Univ. at Arlington.
T. M. Petry, and T. A. Haliburton.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D.C., p 95-104, 1975. 8 fig, 1 tab, 6 ref.

Descriptors: *Erosion, *Soil erosion, *Dispersion, Groundwater movement, Soils, Clays, Laboratory tests, Instrumentation, Measurement, Soil chemistry, Soil engineering, Soil strength, Soil properties, Road construction, Civil engineering.
Identifiers: *Dispersive clay soils, Erosion tests, Erodibility, Internal erosion.

This paper introduced a new physical test method for identification of dispersive clay soil behavior. The significance of this form of internal erosion and the need for such a test were discussed. An analysis of dispersive clay soil behavior was included as a base for understanding the physical erosion test. The theoretical background, apparatus, and process of the proposed physical erosion test were presented. Data for average percentage of erosion were determined during 142 tests on 18 samples of varied properties. Physical erosion test results were correlated with those determined by a chemical property method and the method of plotting soil chemical data on a graph that has empirically derived zones of dispersive clay soil behavior. Correlations achieved were significant. It was concluded that dispersive clay soil behavior depends on the particular combination of chemical, physical, and mineralogical properties of the soil. The physical erosion test and the erosion device used were shown to provide the measure of dispersive clay soil erodibility needed by soils engineers to predict accurate field behavior. (See also W76-12451) (Sims-ISWS)
W76-12460

WATER YIELD MODEL USING SCS CURVE NUMBERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 2A.
W76-12522

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2J.
W76-12571

2H. Lakes

THE EFFECTS OF CADMIUM ON FRESHWATER PHYTOPLANKTON,
Vermont Univ., Burlington. Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W76-12152

SOME ASPECTS OF STOCHASTIC RESERVOIR THEORY,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 4A.
W76-12197

THE TROPHIC STATE OF NORTH CAROLINA LAKES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-12210

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS, PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART I: PHOTOSYNTHETIC PRODUCTION AND ENERGY CONVERSION IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12213

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12214

A RED BLOOM IN HORN SO NEAR LEMVIG (N. W. JUTLAND), CAUSED BY THE DINOFLAGELLATE OXYRHIS MARINA, (IN DANISH),
Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology.
For primary bibliographic entry see Field 5C.
W76-12264

THE INFLUENCE OF GRASS-CARP POPULATION (CTENOPHARYNGODON IDELLA VAL.) ON THE VEGETATION AND ECOSYSTEM OF LAKE TRAKOSCAN, (IN SERBO-CROATIAN),
Zagreb Univ. (Yugoslavia). Institut za Biologijo.
For primary bibliographic entry see Field 5C.
W76-12272

CONTRIBUTION TO EPIZOOTOLOGY OF SCHISTOCEPHALUS PUNGITII (LIGULIDAE) IN THE MANYCH-GUDILO LAKE, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-12273

ON ENVIRONMENTAL FACTORS OF EEL POOLS: I. CHEMISTRY OF THE WATER AND SOIL AND PLANKTON IN OCTOBER 1965 AND JULY 1966, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W76-12275

VERTICAL DISTRIBUTION, SESTONIC SEASONAL DYNAMICE AND THE ROLE OF DETRITUS IN THE LAKE DAL'NEYE ECOSYSTEM, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W76-12301

SESTON OF THE KIEV WATER RESERVOIR AND QUANTITATIVE RATIOS OF ITS COMPONENTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-12302

DISTRIBUTION OF TRACE ELEMENTS IN BOTTOM SEDIMENTS OF THE KIEV RESERVOIR UKRAINIA SSR, USSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W76-12305

DISTRIBUTION OF HETEROTROPHIC BACTERIA IN WATER AND BOTTOM DEPOSITS OF THE KREMENCHUG RESERVOIR IN RELATION TO THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN RUSSIAN),
Kiev State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-12306

BACTERIOPLANKTON REPRODUCTION IN PHIALS WITH FILTERED WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Chita. Transbaik. Complex Expediton.
For primary bibliographic entry see Field 5C.
W76-12319

DESTRUCTION OF ORGANIC MATTER IN GROUNDS OF KAPCHAGAI RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 5C.
W76-12320

ON PHILLIPS' THEORY OF EQUILIBRIUM RANGE IN THE SPECTRA OF WIND-GENERATED GRAVITY WAVES,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
S. A. Kitaigordskii, V. P. Krasitskii, and M. M. Zaslavskii.
Journal of Physical Oceanography, Vol 5, No 3, p 410-420, July 1975. 4 fig, 13 ref, 1 append.

Descriptors: *Wind tides, *Deep water, *Gravity waves, *Distribution patterns, *Energy, Analytical techniques, Theoretical analysis, Dispersion, Model studies, Shallow water, Waves(Water).
Identifiers: *Spectral analysis, *Phillips' theory, Random perturbations, Wave spectrum, Equilibrium range.

According to O. M. Phillips (1958, 1966) space and time scale ranges can exist in the spectra of wind-generated gravity waves within which the energy distribution must depend only on physical parameters characterizing the formation of sharp crests in breaking waves. It was recently shown by Banner and Phillips (See W76-09874) that when long waves move across the surface there is a nonlinear augmentation of the surface drift near the long-wave crests, so that short waves, superimposed on the longer ones, can attain a reduced value of maximum amplitude at the point of incipient breaking. This dynamical effect is in clear contradiction with the initial statement of Phillips' hypothesis on spatial equilibrium spectra. This fact, together with the effect of strongly intermittent nature of short-wave components, must be taken into account in order to obtain a more complete and detailed description of the high-frequency parts of the wind-generated gravity wave spectrum. (Singh-ISWS)
W76-12336

SEASONAL DYNAMICS OF THE PERIPHYTIC MACROFAUNA IN CARP PONDS IN SOUTHWEST BOHEMIA,
Karlova Universita, Prague (Czechoslovakia). Dept. of Hydrobiology.
R. Markosova.
Vestn Cesk Spol Zool. 38(4), p 251-270, 1974.

Descriptors: *Seasonal, *Ponds, Europe, *Carp, Fisheries, Larvae, *Diptera, Substrates, Biomass, Spatial distribution, Periphyton, Fish food organisms.
Identifiers: *Cricotopus-Sylvestris, *Czechoslovakia(Bohemia).

In 2 fish ponds, chironomid larvae were the most important component of the fauna living on submerged substrates. The most abundant species was Cricotopus gr. sylvestris, with maximum numbers and biomass just under the surface. The influence of some environmental factors upon the seasonal and spatial distribution of the chironomid larvae is demonstrated and briefly discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-12395

POPULATION DYNAMICS OF CLADOCERANS IN SUNFISH LAKE, ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
A. S. Clark, and J. C. H. Carter.
Can J Zool. 52(10), p 1235-1242, 1974.

Descriptors: *Canada, *Crustaceans, Lakes, *Daphnia, Fish food organisms, Carrying capacity, Mortality, Reproduction, Aquatic animals.
Identifiers: Daphnia-Retrocurva, Daphnia-Rosea, Diaphanosoma-Leuchtenbergianum, *Sunfish Lake(Ontario).

Investigation of populations of Daphnia rosea, D. retrocurva, and Diaphanosoma leuchtenbergianum in Sunfish Lake, southern Ontario (Canada), during 1969 indicated that, in the absence of predation, food supply was the major factor controlling population size and influencing population parameters. Generally with each species, a population peak was preceded by a rise in fecundity, an increase in birth rate, and a fall in death rate. As the carrying capacity of the environment in terms of food was surpassed in the population numbers declined, fecundity dropped off and the death rate rose. A strong negative correlation between fecundity and death rate was observed.--Copyright 1975, Biological Abstracts, Inc.
W76-12407

FIELD DETERMINATION OF THE DENSITIES OF LAKE ICE SHEETS,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W76-12429

LAKE ONTARIO CIRCULATION IN NOVEMBER,
National Oceanic and AtmosphericAdministration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
R. L. Pickett.
Limnology and Oceanography, Vol. 21, No. 4, p 608-611, July 1976. 2 fig, 7 ref.

Descriptors: *Lake Ontario, *Water circulation, *Lakes, On-site investigations, Current meters, Model studies, Mathematical models, Currents(Water), Winds, Storms, Temperature, Measurement, Winter, Water temperature.
Identifiers: *Gyres, International Field Year for the Great Lakes, November.

A Lake Ontario current meter study during November 1972 showed counterclockwise circulation with higher speeds in the western portion of the lake. Results from wind-driven numerical models run for comparison agreed in the western section, but showed a clockwise gyre in the eastern portion of the lake. (Sims - ISWS)
W76-12430

WAVE FORCES ON VERTICAL CIRCULAR CYLINDER,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W76-12443

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN - SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
For primary bibliographic entry see Field 5G.
W76-12444

AN HISTORICAL PERSPECTIVE OF NUTRIENT INPUTS AND TROPHIC STATES AS DEDUCED FROM CAYUGA LAKE SEDIMENTS,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W76-12463

MICROBIOLOGICAL TRANSFORMATION OF CARBON NITROGEN, SULFUR, IRON, PHOSPHORUS AND CALCIUM COMPOUNDS IN LAKE RESERVOIRS, (IN POLISH),
Polish Association of Sanitary Engineering and Technology, Warsaw.
For primary bibliographic entry see Field 5C.
W76-12494

PHOSPHATE RELEASE AND SORPTION BY LAKE MOHEGAN SEDIMENTS,
City Coll., New York. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-12512

A EUTROPHICATION MODEL FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W76-12515

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-12519

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2J.
W76-12571

GROWTH AND DISSIPATION OF PHYTOPLANKTON IN CHESAPEAKE BAY: I. RESPONSE TO A LARGE PULSE OF RAINFALL,
Johns Hopkins Univ., Baltimore, ,Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 5C.
W76-12572

SCHISTOSOMIASIS AND OTHER HUMAN PARASITOSES OF LAKE LINDU IN CENTRAL SULAWESI (CELEBES), INDONESIA,
For primary bibliographic entry see Field 5C.
W76-12573

THE EUTROPHICATION OF TITI LAKE AND ITS CONSEQUENCES FOR THE POPULATION OF DYNAMICS OF ZOOPLANKTON: 2, (IN GERMAN),
Universidad Austral de Chile, Valdivia. Instituto Zoologio.
For primary bibliographic entry see Field 5C.
W76-12594

METABOLIC RATES OF ARCTIC LAKES,
Atlantic Biological Station, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5C.
W76-12602

2I. Water In Plants

FOREST SOILS AND THE ASSOCIATED SOIL-PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-12239

CONTROLLING SOLAR LIGHT AND HEAT IN A FOREST BY MANAGING SHADOW SOURCES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12241

ON HYDROBIOLOGY: CRITICAL MISAPPREHENSIONS CONCERNING THE DISCIPLINE, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
For primary bibliographic entry see Field 2A.
W76-12269

SURVIVAL OF WHITE AMUR LARVAE UNDER THE EFFECT OF ZINC SULFATE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
V. M. Sabodash.
Gidrobiol Zh. 10(6), p 93-96, 1974.

Descriptors: *Sulfates, *Larval growth stages, Larvae, Fish, Metabolism, Calcium, Fish management.
Identifiers: Ctenopharyngodon-idella, Minerals, *Zinc sulfate, *White amur.

The effect of zinc sulfate on the larval development stages of the white amur (Ctenopharyngodon idella) and the viability of larval changes as a result of this effect, with different contents of Ca in the water, were studied. Zn promotes incorporation in metabolism of Ca from the environment. The use of zinc sulfate during incubation of eggs and rearing the larvae of valuable fish species increased the fitness of their offspring which ultimately increases the yield of stocking material.--Copyright 1975, Biological Abstracts, Inc.
W76-12312

USE OF EMERGENCE DATA FOR ESTIMATING ANNUAL PRODUCTION OF AQUATIC INSECTS,
Oregon State Univ., Corvallis. Dept. of Entomology.
J. A. Speir, and N. H. Anderson.
Limnol Oceanogr. 19(1), p 154-156, 1974.

Descriptors: *Aquatic insects, Estimating, *Productivity, Diptera, Methodology.
Identifiers: Simuliidae, Black flies, Emergence(Insects).

Use of emergence data for aquatic insects is proposed as an indirect method of estimating production rate. Concurrent production and emergence estimates are compared for 4 spp. of black flies (Diptera:Simuliidae). The pooled production:emergence ratios for all 4 spp. were 4.3 in 1971 and 4.8 in 1972.--Copyright 1974, Biological Abstracts, Inc.

W76-12597

A COUNTERSTAINING TECHNIQUE FOR USE IN SORTING BENTHIC SAMPLES,
Waterloo Univ., (Ontario). Dept. of Biology.
D. D. Williams, and N. E. Williams.
Limnol Oceanogr. 19(1), p 152-154, 1974.

Descriptors: *Sampling, *Benthos, Analytical techniques, Detritus, Animals, Pollutant identification.
Identifiers: Chlorazol black, *Staining techniques, Rose bengal, Lugol's iodine.

Two staining techniques for use in benthic sample sorting are described. The primary stain, rose bengal or Lugol's iodine, is counterstained with chlorazol black to provide a high color contrast between the animal and detritus fractions of such samples.--Copyright 1974, Biological Abstracts, Inc.
W76-12606

2J. Erosion and Sedimentation

MAJOR FLOODS, POOR LAND USE DELAY RETURN OF SEDIMENTATION TO NORMAL RATES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-12157

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12188

A UNIFORM MEASURE OF SUBAERIAL EROSION,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.
N. Caine.
Geological Society of America Bulletin, Vol. 87, No. 1, p 137-140, January 1976. 2 tab, 28 ref. USBR Contract No. 14-06-D-7052.

Descriptors: *Geomorphology, *Colorado, *Erosion, *Sediments, Sediment transport, Mudflow, Runoff, Topography, Rivers, Channel erosion.
Identifiers: *Alpine denudation, *Hillside erosion, Potential energy.

The use of geomorphic work as a measure of erosion intensity is illustrated. This allows direct comparisons of the effectiveness of erosion processes with other environmental exchages of energy or material and with relief factors. Because the measure facilitates the comparison of the results of fluvial and hillslope processes, it should be especially useful in situations where a geomorphic system can not be assumed to be in a steady state. An example from an alpine area in southwestern Colorado was used to illustrate the use of geomorphic work as a measure of erosion and to show how it may be compared to other environmental exchanges of material and energy. (Bhowmik - ISWS)
W76-12191

APPLICABILITY OF UNIT STREAM POWER EQUATION,
Army Engineer District, Chicago, Ill.
C. T. Yang, and J. B. Stall.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings Paper 12103, p 559-568, May 1976. 8 fig, 12 ref, 2 append.

Descriptors: *Hydraulics, *Sediment transport, Streamflow, *Mississippi River, *Rivers, *Equations, Movement, Running waters, Open channel flow, Sediment discharge, Bottom sediments, Natural streams, *Rio Grand River, New Mexico, Nebraska, South Carolina.
Identifiers: *Unit stream power equation, *Sediment concentration(Rivers), Niobrara River(Neb), Coup River(Neb), Mountain Creek(SC).

The usefulness of a sediment transport equation to engineering depends on its applicability to natural rivers. Data collected from six river stations were used to compare the applicability of different equations. These comparisons indicated that the dimensionless unit stream power equation is the one which can provide accurate predictions of total sediment discharge in natural rivers under diversified flow and sediment condition. The limitations to which this dimensionless unit stream power equation can be applied are explained. (Lardner - ISWS)
W76-12193

MINERALOGY AND RELATED PARAMETERS OF FLUVIAL SUSPENDED SEDIMENTS IN NORTHWESTERN OHIO,
Guelph Univ., (Ontario).
G. J. Wall, and L. P. Wilding.
Journal of Environmental Quality, Vol. 5, No. 2, p 168-173, April-June 1976. 4 fig, 3 tab, 29 ref.

Descriptors: *Ohio, *Lake Erie, *Fluvial sediments, *Mineralogy, *Clay minerals, *Sediments, Physical properties, Water quality, Chemical properties, Water properties, X-ray diffraction, Quartz, Organic matter, Pesticides, Soil erosion, Trace elements, Silts, Fluvial sediments, Soil erosion, Suspended solids.
Identifiers: *Maumee River basin(Ohio), Blanchard River(Ohio), Outlet Creek(Ohio), Auglaize River(Ohio), *Suspended sediments, Sediment origin, Clay mineralogy, Northwestern Ohio, Mica, Carbonate mineralogy, Soil particles, Sediment pollution.

Stream water samples were collected weekly for 17 months at eight sampling sites in the Maumee River Basin to characterize the clay mineralogy of the suspended sediments and to determine the utility of mineralogy as a marker of the source (rural, urban, geologic) of the sediments. X-ray diffraction analysis of the clay-sized (less than or equal to 2 micrometers) sediments indicated little seasonal or downstream variability in clay mineral composition. The quantities of mica, quartz, and vermiculite-chlorite were 36 + or - 5%, 29 + or - 5%, and 20 + or - 5%, respectively. The quantities of expandables, interstratified, and kaolinite minerals were usually less than or equal to 10%. The 2 to 50 micrometer fraction was dominated by quartz in high flow periods and secondary calcite in low flow periods. When fluvial suspended sediment properties were compared to properties of regional soil materials, mineralogy appeared to be a useful index to differentiate between surficial and geologic (parent material) sources of suspended sediments. The mineralogical characterization of the fluvial suspended sediments in combination with chemical data led to the conclusion that the annual suspended sediment load of the Maumee River and tributaries was predominantly surficial in origin. (Henley - ISWS)
W76-12203

SEDIMENT DISCHARGE FROM HIGHWAY CUT-SLOPES IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972-74,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W76-12279

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-12284

MAP OF OVERDIP SLOPES THAT CAN AFFECT LANDSLIDING IN ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12300

DISTRIBUTION OF TRACE ELEMENTS IN BOTTOM SEDIMENTS OF THE KIEV RESERVOIR UKRAINIA SSR, USSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W76-12305

SAND LEVEL CHANGES ON TORREY PINES BEACH, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W76-12383

ORGANIC MATTER LOSSES FROM FOUR WATERSHEDS IN THE HUMID TROPICS,
East Carolina Univ., Greenville, N. C. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-12428

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-12442

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
For primary bibliographic entry see Field 2G.
W76-12451

DETERMINATION OF DISPERSIVE CLAY SOIL ERODIBILITY BY USING A PHYSICAL TEST,
Texas Univ. at Arlington.
For primary bibliographic entry see Field 2G.
W76-12460

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
P. Papacostea, S. Nastea, E. Popa, N. Petre, and C. Bondoc.
An Inst Stud Cercet Pedol. 40, p 197-213, 1972 (1974).

Descriptors: *Soil profile, *Bioindicators, *Bacteria, *Organic matter, Climates, Groundwater, Lakes, Microbiology, *Pseudomonas, *Azotobacter, Dehydration, Soil analysis, *Lake sediments, *Pollutant identification.
Identifiers: Azotobacter-Chroococcum, Bacillus-Subtilis, Dehydrogenase, Lacustrine, Pseudomonas-Aurantiaca, Pseudomonas-Lemonnieri, *Greaca Lake(Romania).

Two soil profiles, reclaimed 5 yr and 1 yr, respectively were characterized by a rich and varied microflora. The association of microbial indicators consisted of Bacillus subtilis, orange colored,

Azotobacter chroococcum Pseudomonas lemonnieri and P. aurantiaca. The quantitative variations of bacteria and the dehydrogenase activity show vertical fluctuations which, generally, are not related to the depth, except at 0-5 cm, where an increased number of bacteria occur. The quantitative distribution reflects the lack of homogenity of organic matter distribution and the effects of climate conditions and ground water level.--Copyright 1975, Biological Abstracts, Inc.
W76-12571

2K. Chemical Processes

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Research Lab.
For primary bibliographic entry see Field 5B.
W76-12172

THE CHEMISTRY OF 700 YEARS OF PRECIPITATION AT DYE 3, GREENLAND,
Army Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 5A.
W76-12181

CARBON CONTENTS OF SURFACE AND UNDERGROUND WATERS IN SOUTH-CENTRAL MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5A.
W76-12202

AUTOMATIC DETERMINATION OF SULFATES BY AN IMPROVED NEPHELOMETRIC METHOD: APPLICATION TO THE DETERMINATION OF SO2 IN ATMOSPHERIC AIR AND OF SULFATES IN RAIN WATER, (IN FRENCH),
Institut d'Hygiene et d'Epidemiologie, Brussels (Belgium).
For primary bibliographic entry see Field 5A.
W76-12259

ON THE METHODS OF DETERMINING THE SULFATE CONTENT OF WATER, AND THE DESCRIPTION OF A NEW PHOTOMETRIC METHOD, (IN HUNGARIAN),
Wasser-Kanalis. Komitats Hajdu-Bihar, Debrecen (Hungary).
For primary bibliographic entry see Field 5A.
W76-12270

WATER AVAILABILITY OF MONROE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12281

GUIDE TO THE AVAILABILITY OF HYDROLOGIC DATA, GREATER PITTSBURGH REGION, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12282

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-12284

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W76-12288

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W76-12289

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-12290

CHEMICAL CHARACTERISTICS OF THE MAJOR THERMAL SPRINGS OF MONTANA,
Geological Survey, Menlo Park, Calif.
R. H. Mariner, T. S. Presser, and W. C. Evans.
Open-file report 76-480, July 1976. 31 p, 2 fig, 10 tab, 26 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Water chemistry, *Stable isotopes, *Montana, Water temperature, Warm springs, Hot springs, Deuterium, Oxygen isotopes, Carbon dioxide, Nitrogen, Argon, Hydrogen ion concentrations.
Identifiers: Aquifer temperatures, Geothermometers.

Twenty-one thermal springs in western Montana were sample for chemical, isotope, and gas compositions. Most of the springs issue dilute to slightly saline sodium-bicarbonate waters of neutral to slightly alkaline pH. A few of the springs issue sodium-mixed anion waters of near neutral pH. Fluoride concentrations are high in most of the thermal waters, up to 18 milligrams per liter, while F/C1 ratios range from 3/1 in the dilute waters to 1/10 in the slightly saline waters. Most of the springs are theoretically in thermodynamic equilibrium with respect to calcite and fluorite. Nitrogen is the major gas escaping from most of the hot springs; however, Hunters Hot Springs issue principally methane. The deuterium content of the hot springs waters is typical of meteoric water in western Montana. Geothermal calculations based on silica concentrations and Na-K-Ca ratios indicate that most of the springs are associated with low temperature aquifers (less than 100 degrees C). Chalcedony may be controlling the silica concentrations in these low temperature aquifers even in 'granitic' terranes. (Woodard-USGS)
W76-12293

GROUND-WATER RESOURCES OF LANE AND SCOTT COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12298

MAPS SHOWING GROUND-WATER CONDITIONS IN THE HARQUAHALA PLAINS AREA, MARICOPA AND YUMA COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-12299

WINTER HYDROCHEMICAL CONDITIONS OF SMALL RIVERS IN THE POLESYE OF THE UKRAINIAN SSR (THE PRIPYAT BASIN), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-12303

SANITARY AND HYGIENIC EVALUATION OF THE WATER OF THE UZHGOROD WATER SUPPLY SYSTEM, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-12313

LABORATORY COMPARISONS OF FOUR SURFACE MICROLAYER SAMPLERS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
R. F. Hatcher, and B. C. Parker.
Limnol Oceanogr. 19(1), p 162-165, 1974.

Descriptors: *Sampling, Data collections, Analytical techniques, *Laboratory equipment, Laboratory tests.
Identifiers: *Microlayer samplers.

The collection and recovery efficiencies of 4 surface microlayer samplers used by various investigator, compared under laboratory controlled conditions, reveal significant variations.--Copyright 1974, Biological Abstracts, Inc.
W76-12397

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W76-12466

WATER -- UNUSUAL RAW MATERIAL AT THE SERVICE OF THE PAPER INDUSTRY (L'EAU -- MATIERE PREMIERE ANORMALE AU SERVICE DU PAPETIER),
For primary bibliographic entry see Field 3E.
W76-12484

SEVERAL WATER CHEMISTRY DATA ON THE KNOWLEDGE OF THE SECTION OF THE DANUBE BETWEEN BUDAPEST AND TURNU SEVERIN (1645-930 KM) (DANUBIALIA HUNGARICA LXVII), (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
For primary bibliographic entry see Field 5A.
W76-12574

2L. Estuaries

FURTHER THERMAL ADDITION STUDIES AT CRYSTAL RIVER, FLORIDA WITH AN ANNOTATED CHECKLIST OF MARINE FISHES COLLECTED 1969-1971,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-12163

HYDROGRAPHY AND PHYTOPLANKTON OF THE COAST OF CASTELLON, FROM SEPTEMBER 1969 TO JANUARY 1971, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
For primary bibliographic entry see Field 5A.
W76-12164

MASS TRANSPORT IN GRAVITY WAVES ON A SLOPING BOTTOM,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.

E. W. Bijker, J. P. Th. Kalkwijk, and T. Pieters.
Report 75-1. 125 p, 17 fig, 3 tab, 17 ref, 3 append.

Descriptors: *Sediment transport, *Coasts, *Ocean waves, *Velocity, *Hydraulics, Movement, Laboratory tests, Analytical techniques, Roughness(Hydraulic), Model studies, Gravity waves, Waves(Water), Slopes, mathematical models.
Identifiers: *Wave theory, *Drift velocities, Mass transport.

The influence of bottom slope on mass transport by progressive waves was investigated, both theoretically and experimentally. Theoretical considerations, based on linear wave theory, show the greatest influence of the slope on the bottom drift velocities for relatively long waves and steep slopes. The bottom drift velocities are most important for sediment transport in coastal areas. Experiments were carried out on three sloping bottoms. The general conclusions were: (1) the mass transport velocities at the bottom on the slopes seem to be determined by the local depth rather than by the slope-angle; (2) these velocities, predicted by the horizontal bottom theory, are too large for the sloping bottom; (3) the discrepancy between theory and experiment increases with decreasing depth and increasing relative wave length and wave height; (4) the inclusion of the change in wave form and slope effect appears to explain the behavior of the bottom velocities qualitatively; and (5) the drift velocities change slightly for increasing bottom roughness and considerably when a ripple-like roughness is present. (Singh - ISWS)
W76-12190

AN ORTHOGONALIZED CONVOLUTION METHOD OF TIDE PREDICTION,
Hawaii Inst. of Geophysics, Honolulu.
G. W. Groves, and R. W. Reynolds.
Journal of Geophysical Research, Vol. 80, No. 30, p 4131-4138, October 20, 1975. 4 fig, 5 tab, 12 ref. NSF GA-1117, GA-17137.

Descriptors: *Tides, *Oceans, *Analysis, *Hawaii, Gravity, Estuaries, Tidal effects, Equations, Diurnal, *Forecasting.
Identifiers: *England, *Tidal analysis, Tidal prediction, Orthogonal functions, Orthotides, Tidal admittance, Convolution method, Harmonic method.

Linear combinations of a set of special orthogonal tidal functions, referred to as orthotides, were proposed to represent the tidal input functions and the observed tide. These functions differed from the usual harmonic functions in that successive members correspond to successively more wiggly terms in the linear admittance function. As in convulotion method, the appropriate tidal constants were determined from the mean displaced products of the observed tide with the tidal input functions. Munk and Cartwright's analyses of 19 years of data from Honolulu, Hawaii and Newlyn, England were used to estimate the linear gravitational orthotide constants for those locations. The general decrease of magnitude with order of the orthotide constants indicated that the tidal admittance was relatively smooth. A procedure was outlined for a similar development of the bilinear tidal response. This orthogonal method was suggested for routine analysis and prediction. (Adams - ISWS)
W76-12192

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
G. R. Bafus, and G. L. Guymon.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12139, p 123-139, May 1976. 7 fig, 25 ref, 2 append.

Descriptors: *Coastal engineering, *Islands, Oil wells, *Alaska, Freezing, *Offshore platforms, Ice, Equations, Sea ice, Shores, Coasts, Temperature, Cold regions, Cold weather construction, *Model studies, Mathematical models, *Finite element analysis, Structures, Mathematical studies, Civil engineering, Meteorology.
Identifiers: *Man-made islands, *Barter Island(Alaska).

A two-dimensional finite element analysis of the thermal state of man-made frozen islands was presented. The model included an air-ground interface energy exchange simulator that incorporated available meteorological parameters for application to offshore areas in the Alaskan arctic. Comparison of simulations with analytical and available data indicated an accurate and efficient model. Two hypothetical island configurations were analyzed using actual meteorological data obtained at Barter Island, Alaska. Results suggested that islands constructed of dredged materials are feasible in shallow waters. (Sims - ISWS)
W76-12200

INCREASING THE MEAN CURRENT IN COASTAL CHANNELS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
J. van de Kreeke.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12157, p 223-234, May 1976. 7 fig, 4 tab, 8 ref, 1 append.

Descriptors: *Channels, *Currents(Water), *Inlets(Waterways), *Tidal waters, Tides, Estuaries, Laboratory tests, Equations, Mathematical studies, Weirs, Flow.
Identifiers: *Waterways, Flushing, River currents, Tidal currents.

Results of previously published theoretical studies suggest that properly designed inlets and channel constrictions, or both, can considerably increase the mean current in coastal channels. This was further investigated by laboratory experiments in a channel of uniform width and depth at each end connected to the same tidal basin. A mean current was induced by providing one end of the channel with a constriction in the form of a submerged weir. Measured values for the mean current were in good agreement with values obtained by numerical integration of the governing hydrodynamic equations. For each experiment, the direction of the mean current was the same for each point in the vertical. The direction of the mean current was not the same for all experiments. To aid in the interpretation of the results, an approximate analytic expression for the mean current was derived. (Lee - ISWS)
W76-12201

SEA LEVEL COMPUTATIONS OF THE BALTIC WITH A 20-CANAL MODEL,
Fishery Board of Sweden, Goteborg. Hydrographic Dept.
A. Svansson, and J. Szaron.
Tellus, Vol. 27, No. 6, p 596-605, 1975. 4 fig, 15 ref.

Descriptors: *Oceans, *Sea level, *Water level fluctuations, *Hydrodynamics, *Currents(Water), Numerical analysis, Channel flow, Flow resistance, Estuaries, Equations, Mathematical models.
Identifiers: *Baltic Sea, *Kattegat, *Belt Sea, Wind stress, One-dimensional analysis.

The Kattegat, Belt Sea, and the Baltic Sea were treated as a branching system of one-dimensional canals. Sea levels and water transports were computed from the hydrodynamical equations, including terms of acceleration, wind stress, atmospheric pressure, tidal acceleration, and bottom friction. Some non-linear terms were retained. The sea water was assumed to be homogeneous. The computations were made numerically by means of an explicit difference model with 15-minute time steps. Results of the computations were given for August 1-5, 1964, when international cooperation provided field data throughout the Baltic Sea. (Adams - ISWS)
W76-12205

COASTAL ENGINEERING CONFERENCE, FOURTEENTH. PROCEEDINGS. COPENHAGEN, DENMARK, JUNE 24-28, 1974.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 5G.
W76-12221

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH A PIPELINE LANDFALL IN COASTAL DUNES AT CRUDEN BAY, ABERDEENSHIRE, SCOTLAND,
Aberdeen Univ. (Scotland).
For primary bibliographic entry see Field 5G.
W76-12223

OCEAN 72, IEEE INTERNATIONAL CONFERENCE ON ENGINEERING IN THE OCEAN.
Institute of Electrical and Electronics Engineers, Inc., New York.
For primary bibliographic entry see Field 5G.
W76-12224

PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL GULF AND CARIBBEAN FISHERIES INSTITUTE.
Miami Univ., Fla.
For primary bibliographic entry see Field 6G.
W76-12226

TRACE METALS AND POLLUTION OF THE BELGIAN COAST AND OF THE SCHELT ESTUARY, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
For primary bibliographic entry see Field 5A.
W76-12260

DETERMINATION OF BORON IN DRINKING WATER FROM KOSZALIN PROVINCE, (IN POLISH),
Medical Academy, Poznan (Poland). Inst. of Chemistry and Analytics.
For primary bibliographic entry see Field 5A.
W76-12261

SUCCESSION OF PLANKTON DIATOMS IN TOKYO BAY, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W76-12268

THE SHALLOW AQUIFER--A PRIME FRESHWATER RESOURCE IN EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-12278

HYDROGRAPHY AND PHYTOPLANKTON FROM THE BAY OF CADIZ, FROM JANUARY OF 1970 TO DECEMBER OF 1973, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5A.
W76-12309

THE MERCURY CONCENTRATION IN EELS (ANGUILLA ANGUILLA) FROM THE ESTUARY OF THE GUADALQUIVIR RIVER AND 'ESTEROS' OF SALINES OF CADIZ BAY, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Dadiz (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5C.
W76-12321

EFFECTS OF A WASTE OF 'PAPER KRAFT' ON THE BENTHIC ALGAL POPULATIONS IN N.W. SPAIN. 'STRESS' ON THE FUCACEAE STANDING CROP, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Vigo (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5C.
W76-12327

EFFECTS OF COPPER ON SURVIVAL AND OSMOREGULATION IN MARINE AND BRACKISH WATER ISOPODS (CRUSTACEA),
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
For primary bibliographic entry see Field 5C.
W76-12333

ON PHILLIPS' THEORY OF EQUILIBRIUM RANGE IN THE SPECTRA OF WIND-GENERATED GRAVITY WAVES,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 2H.
W76-12336

BASIC REMOTE SENSING INVESTIGATIONS FOR BEACH RECONNAISSANCE: AN INTERIM REPORT,
Environmental Research Inst. of Michigan, Ann Arbor.
D. J. Leu, C. T. Wezernak, P. Jackson, F. Thomson, and R. Shuchman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A013 338, $5.00 in paper copy, $3.00 in microfiche. Technical Report No. 108900-3-T, August 1975. 91 p, 16 fig, 15 tab, 19 ref, 3 append. ONR - N0014-74-C-0273.

Descriptors: Continental Shelf, Resources development, Environmental effects, *Remote sensing, *Beaches, *Intertidal areas, *Radar, Water quality control, *Instrumentation, Coasts, Benthos, Computer programs.
Identifiers: Outer Continental Shelf, *Bottom topography, *Optical sensor data, Offshore technology, Multispectral scanners.

Progress is reported on three tasks designed to develop remote sensing beach reconnaissance techniques applicable to the benthic, beach intertidal, and beach upland zones. Task 1 is designed to develop remote sensing indicators of important beach composition and physical parameters which will ultimately prove useful in models to predict beach conditions. Task 2 is designed to develop remote sensing techniques for survey of bottom features in the benthic zone. Task 3 is designed to develop radar processing techniques to delineate important beach intertidal and upland parameters and to better understand the potential of radar-derived information when used with optical sensor data. (Sinha OEIS)
W76-12375

PREDICTED OIL SLICK MOVEMENT FROM VARIOUS LOCATIONS OFF THE NEW JERSEY-DELAWARE COASTLINE,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W76-12376

AN IN-SITU INVESTIGATION OF OIL BARRIER SHAPE AND DRAG COEFFICIENTS,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-12378

SAND LEVEL CHANGES ON TORREY PINES BEACH, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
C. E. Nordstrom, and D. L. Inman.
Available from the National Technical Information Service, Springfield VA 22161, as ADA-019 833, $6.75 in paper copy, $3.00 in microfiche. U. S. Army Corps of Engineers, Coastal Engineering Research Center Miscellaneous Paper No. MP-11-75, December 1975. 166 p, 10 fig, 10 ref, 8 append. DACW72-72-C-0020.

Descriptors: *Waves(Water), *Seasonal, *Water levels, *Beaches, Resources development, *Environmental effects, *Sediment transport, *Sea level, Coasts, Beach erosion, Sands, *California.
Identifiers: *Outer Continental Shelf, *Beach profiles, Wave regime, *Torrey Pines Beach(Calif).

Three parallel range lines were established along a straight beach at Torrey Pines, California, and were surveyed at monthly intervals during June 1972 to May 1974. Offshore sand level changes were measured using reference rods placed in the bottom at selected stations on each range line. Beach profile measurements indicate that the beach underwent seasonal changes in configuration which are related to changes in the wave regime. During the summer months the beach profile progressively changed with the seaward progradation of the berm crest by sand accretion. This change was caused by onshore transport of sand from immediately offshore depths of less than -20 feet (-6.1 meters) relative to MSL. The transition from the summer to the winter beach profile was abrupt with the coincident occurrence of high waves and tides. Periods of high waves during high tides resulted in wave swash overtopping the berm crest and quickly eroding the beach. The rapid shoreward retreat of the berm crest caused by the offshore transport of sand was accompanied by a corresponding deposition of sand offshore at depths less than -30 feet (-9 meters) relative to MSL. (Sinha-OEIS)
W76-12383

MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974,
Naval Postgraduate School, Monterey, Calif.
R. E. Blumberg.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-019 283, $6.00 in paper copy, $3.00 in microfiche. Master's Thesis, September 1975. 142 p, 19 fig, 2 tab, 10 ref, 8 append.

Descriptors: Water properties, *Currents(Water), *California, Data processing, *Profiles, Coasts, Bays, *Pacific Ocean, *Salinity, Water temperature, *Variability, Spatial distribution, Temporal distribution.
Identifiers: *California Current system, Mesoscale variations, Water masses, *Monterey Bay(CA), Salinity profiles.

Continuous salinity and/or temperature profiles were made off the coast of Monterey Bay monthly between August 1973 and August 1974 and on a spatial grid finer than is conventionally used. A procedure is described to convert the data from analog to digital form, process these data on an IBM 360 computer, and print out the results by station for each month. The results show water mass features of small spatial scale detectable only because of the small grid spacing. A gyre or filament structure is suggested by the north to south variation between lines of stations. The extent of the area of survey is insufficient to describe completely the water mass structure on both the eastern and western boundaries; however, the temporal variation in the observed water mass structure is consistent with the three oceanographic seasons described for the California Current system. Elements of relatively cold water and relatively warm water masses are identified in the area of survey. (Sinha-OEIS)
W76-12386

MESOSCALE COMPONENT OF THE GEOSTROPHIC FLOW AND ITS TEMPORAL AND SPATIAL VARIABILITY IN THE CALIFORNIA CURRENT OFF MONTEREY BAY IN 1973-74,
Naval Postgraduate School Monterey, Calif.
R. E. Greer.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A019 284, $7.50 in paper copy, $3.00 in microfiche. Master's Thesis, September 1975. 179 p, 13 ref.

Descriptors: *Continental Shelf, Water property, *Flow characteristics, *Currents(Water), *California, Water resources, Salinity, Water circulation, *Pacific Ocean, Variability, Spatial distribution, Temporal distribution.
Identifiers: *Outer Continental Shelf, *Geostrophic flow, *Bottom topography, Seasonal variations, Mesoscale component, Surface currents, Salt transport, *Monterey Bay(CA).

The mesoscale components of the geostrophic flow and its temporal and spatial variability are discussed for the oceanic region west of the continental shelf off Monterey Bay. The results were obtained from spatially dense observations on thirteen cruises between August 1973 and August 1974. Patterns of current flow indicated by drogues and geostrophy tend to confirm an analysis of the structure which has alternating element of poleward and equatorward flow. Surface current flow patterns are similar to those found at depths to 375 m. The bottom topography influences the direction of flow inside the 1,000 fathom curve. Seasonal variations of the geostrophic flow and salt transport were congruent with Skogsberg's (1936) annual cycle composed of three distinct oceanographic seasons. The flow and structure in the area are complex with flow elements less than 10 km in width. The data suggest that observations on a sampling grid length less than 10 km transverse to the current flow, and extensive independent current measurements are required to describe adequately the small-scale features of the flow, structure and its time variations. (Sinha-OEIS)
W76-12387

ANALYSIS OF THE ROLE OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas Engineering Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W76-12389

ENVIRONMENTAL IMPLICATIONS OF MAINTENANCE AND IMPROVEMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12390

AN ALTERNATE GRAZING HYPOTHESIS FOR THE PATUXENT ESTUARY,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Heinle.
Chesapeake Sci. 15(3), p 146-150, 1974.

Descriptors: *Maryland, Estuaries, *Energy budget, Copepods, *Jelly fish, Phytoplankton, Zooplankton, *Fish food organisms.
Identifiers: *Ctenophore, *Patuxent estuary(Md).

A substantial error in an earlier paper led Miller and Williams to conclude that there was insufficient phytoplankton and zooplankton in the Patuxent estuary, Maryland, to support the populations of ctenophores and jellyfish. Calculations of a revised energy budget suggests that there may, at times, be insufficient zooplankton, but that phytoplankton stocks are more than adequate for the needs of the ctenophores, the jellyfish and the copepods.--Copyright 1974, Biological Abstracts, Inc.
W76-12396

TIDE-POWERED ELECTRICAL GENERATOR,
For primary bibliographic entry see Field 8C.
W76-12403

INFLUENCE OF SURFACE WAVES ON SUBSURFACE CURRENT MEASUREMENTS IN SHALLOW WATER,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
D. Halpern, and R. D. Pillsbury.
Limnology and Oceanography, Vol. 21, No. 2, p 611-616, July 1976. 5 fig, 12 ref. NSF GS-28746, GS-33502, AG-299.

Descriptors: *Ocean currents, *Ocean circulation, *Pacific Ocean, *Oregon, Coasts, Continental shelf, *Currents(Water), Current meters, Time series analysis, On-site investigations, Measurement, *Waves(Water).
Identifiers: *Aanderaa current meters.

Aanderaa current-meter readings were taken at 43 m at two sites 0.2 km apart in water 50 m deep near the central Oregon coast. The uppermost extensions of the subsurface moorings were about 3 and 18 m deep. During a 25-day period in July and August 1973, mean speeds differed by about 47%. For low frequencies (less than 0.7 cph) there was a 1:1 correspondence between the shapes of the kinetic-energy density spectra. For all frequencies, spectral density estimates of the data recorded beneath the deeper placed topmost float were lower than the estimates of the other data. The effect of surface wave motion on Aanderaa current measurements was discussed. (Sims - ISWS)
W76-12431

CHEMICAL AND MICROBIOLOGICAL DEGRADATION OF MALATHION AND PARATHION IN AN ESTUARINE ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, Miss. Microbiology Section.
For primary bibliographic entry see Field 5B.
W76-12437

INTERACTION OF WATER WAVES WITH CYLINDER BARRIER,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W76-12441

WAVE FORCES ON VERTICAL CIRCULAR CYLINDER,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W76-12443

OXYGEN ISOTOPE STUDIES ON SEA ICE IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2C.
W76-12448

IMPACT OF HURRICANE TIDAL SURGES ON SUBSEQUENT LAND USE CHANGES AND WATER RESOURCES REALLOCATION,
University of Southern Mississippi, Hattiesburg. Dept. of Geography and Area Development.
For primary bibliographic entry see Field 4A.
W76-12461

SOME OBSERVATIONS ON THE CONTAMINATION OF THE COASTAL WATERS OF THE CITY OF CUMANA, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-12467

EVALUATION OF PROPOSED SEWAGE SLUDGE DUMPSITE AREAS IN THE NEW YORK BIGHT.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5E.
W76-12469

SOME REMARKS ON THE UNUSUAL BEAUFORT SEA ICE CONDITIONS IN SUMMER 1975,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W76-12470

AN IMPROVED IN SITU PH SENSOR FOR OCEANOGRAPHIC AND LIMNOLOGICAL APPLICATIONS,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W76-12479

LARGE SCALE SYSTEMS APPROACH TO ESTUARINE WATER QUALITY MODELLING WITH MULTIPLE CONSTITUENTS,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-12517

AN INTERDISCIPLINARY MATHEMATICAL MODEL APPLIED TO THE SOUTHERN BIGHT OF THE NORTH SEA,
Liege Univ. (Belgium). Institut de Mathematique.
For primary bibliographic entry see Field 5B.
W76-12518

ANOTHER VIEW OF OFFSHORE OIL AND GAS OPERATIONS.
For primary bibliographic entry see Field 5G.
W76-12577

HYDROCARBON RESIDUES IN IVORY COAST WATERS,
For primary bibliographic entry see Field 5C.
W76-12579

THE LINKAGE BETWEEN CHEMICAL POLLUTION AND BACTERIOLOGICAL POLLUTION IN COASTAL ZONES. (RECHERCHE D'UNE LIAISON ENTRE LA POLLUTION CHIMIQUE ET LA POLLUTION BACTERIOLOGIQUE DANS LES ZONES LITTORALES),
Commissariat a l'Energie Atomique, Pierrelatte (France).
For primary bibliographic entry see Field 5B.
W76-12590

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

1973-1974 SALINE WATER CONVERSION SUMMARY REPORT.
Office of Saline Water, Washington, D. C.
Available from the Supt. of Documents, GPO, Washington, DC 20402, $1.55. Report, 1974. 64 p, 25 fig, 6 tab, 4 append.

Descriptors: *Saline water, *Research and development, *United States, *Desalination, Desalination apparatus, Desalination plants, Desalination processes, Freezing, Membrane processes, Mexican water treaty, Colorado River, Pilot plants, Federal government, Reverse osmosis, Ion exchange, Dialysis, Brackish water, Sea water, Research facilities, Projects, On-site investigations.
Identifiers: Wellton-Mohawk irrigation and drainage district.

Negotiations between the United States and Mexico to resolve the salinity problems of the Colorado River at the International Boundary have resulted in an agreement calling for delivery of water at Morelos Dam (where most of Mexico's irrigation water is diverted from the Colorado), which does not exceed in salinity by more than 115 + or - 30 parts per million the water which arrives at the Imperial Dam from the Colorado River. The main item in the proposed solution is the construction of the world's largest desalting plant, which will treat the return flows from the Wellton-Mohawk Irrigation and Drainage District. The Office of Saline Water (OSW) established a small test facility near Yuma, Arizona, on the banks of the Wellton-Mohawk Drain. Seven manufacturers of brackish water desalting equipment, at their own expense, have located pilot plants at the site. OSW is also conducting experimental development work at the Roswell, New Mexico, brackish water test facility. At present, major emphasis is being placed on the development of membrane processes for sea water, on the freezing processes, and on other new processes that are emerging from basic research efforts. The work and accomplishments of OSW's research and development program in the past year were summarized. (Robinson - ISWS)
W76-12343

HYGIENIC EVALUATION OF ELECTRODIALYSIS WATER DESALINATION SET UP, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5D.
W76-12394

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC FLUSHING,
Desalination Systems, Inc., Escondido, Calif. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12402

CONSTRUCTION AND OPERATION OF HIGH-PRESSURE FILTERS WITH MOLECULAR SIEVES (BUDOWA I DZIALANIE WYSOKOCISNIENIOWYCH FILTROW Z SITAMI MOLEKULARNYMI),
Technical Univ., Lodz (Poland). Inst. of Papermaking and Paper Machinery.
For primary bibliographic entry see Field 5D.
W76-12509

3B. Water Yield Improvement

WATER YIELD IMPROVEMENT RESEARCH OF THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION AND ITS USEFULNESS TO WILDLAND RESOURCE MANAGEMENT,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-12170

THE AWS HANDBOOK OF GROUND-BASED COLD FOG DISSIPATION USING VENTED LIQUID PROPANE, VOLUME I - THEROY AND PRACTICE.
Air Weather Service, Scott AFB, Ill.
Report AWS-TR-75-255, July 1975. 55 p, 23 fig, 2 tab, 16 ref, append. Chary, H.A., and Lininger, R.L., editors.

Descriptors: *Weather modification, *Fog, *Propane, Airports, Operation and maintenance, Atmospheric physics, Particle size, Drops(Fluids), Temperature, Climatology, Meteorology, Physics, Engineering.
Identifiers: *Cold fog, *Fog dissipation, Visibility.

The theory and practice of ground-based cold fog dissipation using vented liquid propane were explained. The cumulative Air Weather Service expertise in ground-based cold fog dissipation was summarized. The following observations were made: Cold fog dissipation is dependent on the phase transition of liquid water to ice. The ice phase is initiated by severe local cooling due to the adiabatic expansion of vented liquid propane. The ice crystals grow at the expense of the supercooled fog droplets and fall out, thus effecting a clearing. Three operational cold fog dissipation networks were illustrated. Generalized guidance for planning, procuring, installing, and operating a cold fog dissipation system were given. (Sims - ISWS)
W76-12471

WINDBREAKS MAY INCREASE WATER YIELD FROM THE GRASSLAND ISLANDS IN ARIZONA'S MIXED CONIFER FORESTS,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
J. R. Thompson, O. D. Knipe, and P. M. Johnson.
In: Hydrology and Water Resources in Arizona and the Southwest Vol. 6, p 323-329, Proceedings 1976 Meeting of the Arizona Section, American Water Resources Association and Hydrological section, Arizona Academy of Sciences (Tuscon, Arizona), April/May, 1976. 9 fig, 3 ref.

Descriptors: *Water yield improvement, *Grasslands, *Arizona, *Windbreaks, Water yield, Water supply, Snowpacks, Forest management, Watershed management, Hydrologic properties, Climates, Soil properties, Trees, Soil fungi, Snow, Snow cover.
Identifiers: Mycorrhiza.

The general hydrologic characteristics, selected climatic factors, and soil properties of the high-elevation grasslands are compared to the surrounding forest. Water yield could be increased by 1.5-2.0 inches if snow could be held where it falls. It may be possible to establish tree windbreaks in the grassland by altering the microclimate during establishment, and introducing mycorrhiza with the planted seedlings. (Witt-IPC)
W76-12477

3C. Use Of Water Of Impaired Quality

QUALITY OF POTATOES GROWN ON FIELDS IRRIGATED WITH WASTEWATERS OF COAL-TAR CHEMICAL AND METALLURGICAL PLANTS, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-12355

HYGIENIC EVALUATION OF POTATOES GROWN IN SOIL IRRIGATED WITH EFFLUENTS FROM COKING AND CHEMICAL PLANTS OF THE DONETS COAL BASIN, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-12369

WASTEWATER RESOURCES IN NORTH CENTRAL TEXAS,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5G.
W76-12652

3D. Conservation In Domestic and Municipal Use

SANITARY AND HYGIENIC EVALUATION OF THE WATER OF THE UZHGOROD WATER SUPPLY SYSTEM, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-12313

3E. Conservation In Industry

EXPERIENCE IN DECONTAMINATION OF INDUSTRIAL WASTES AND TREATMENT PLANT SEDIMENTS IN LENINGRAD, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W76-12291

METHODS FOR REMOVING FLUOBORATES FROM AQUEOUS MEDIA,
Galson Technical Services, Inc., Syracuse, N.Y. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12398

METHOD FOR SLUDGE TREATMENT,
System AB Infoteknik, Vasteras (Sweden). (Assignee).
For primary bibliographic entry see Field 5D.
W76-12410

CHEMICALS AND ALLIED PRODUCTS (LITERATURE REVIEWS),
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 5D.
W76-12412

$10-MILLION AGGREGATE PLANT RECYCLES PROCESS WATER,
Acres Consulting Services Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W76-12414

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W76-12415

THE CLOSED-CYCLE BLEACHED KRAFT PULP MILL,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 5D.
W76-12417

ZERO DISCHARGE AS EXEMPLIFIED BY TEXTILE DYEING AND FINISHING,
Clemson Univ., S. C. Coll. of Industrial Management and Textile Science.
For primary bibliographic entry see Field 5D.
W76-12421

TANNERY WASTE MANAGEMENT, (LITERATURE REVIEWS),
Cincinnati Univ., Ohio. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-12423

SOME WASTE TREATMENT PROBLEMS IN THE HIDE AND LEATHER INDUSTRIES,
For primary bibliographic entry see Field 5D.
W76-12424

NEW BEAMHOUSE DEVELOPMENT TO SIMPLIFY TANNERY WASTE WATER MANAGEMENT,
Instituut TNO voor Leder en Schoenen, Waalwijk (Netherlands).
For primary bibliographic entry see Field 5D.
W76-12427

UTILIZATION OF CLEAR WATER SEWAGE EFFLUENT IN MINERAL PROCESSING,
Arizona Bureau of Mines, Tucson.
For primary bibliographic entry see Field 5D.
W76-12464

MILL EFFLUENT TREATMENT AND FIBER RECOVERY.
For primary bibliographic entry see Field 5D.
W76-12474

WATER -- UNUSUAL RAW MATERIAL AT THE SERVICE OF THE PAPER INDUSTRY (L'EAU -- MATIERE PREMIERE ANORMALE AU SERVICE DU PAPETIER),
J. Vilars.
Papier, Carton et Cellulose, Vol. 25, No. 4, p 40-51, April, 1976. 20 fig, 1 tab.

Descriptors: *Water chemistry, *Water properties, *Water structure, *Pulp and paper industry, Surface tension, Viscosity, Ionization, Hydrogen ion concentration, Oxidation-reduction potential, Chemical properties, Physical properties, Water, Industrial water, Electrical properties.

Water is discussed with respect to chemical structure, physical properties (different states and heat energies, surface tension, viscosity, dielectric constant), and chemical properties (dissolving power, ionization and pH, redox potential), with emphasis on the importance of the various properties in papermaking applications of water. (Speckhard-IPC)
W76-12484

REMOVAL AND RECOVERY OF PHENOLS FROM INDUSTRIAL WASTE EFFLUENTS WITH AMBERLITE XAD POLYMERIC ADSORBENTS,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-12487

FIRST CLOSED-CYCLE KRAFT MILL,
For primary bibliographic entry see Field 5D.
W76-12488

MONADNOCK CLEANS UP: SPECIALTY PAPER MILL INSTALLS $1-MILLION WASTE TREATMENT SYSTEM.
For primary bibliographic entry see Field 5D.
W76-12490

CONTAINER CORP. BOXBOARD PLANT INSTALLS CLARIFICATION, SLUDGE RECYCLING SYSTEM.
For primary bibliographic entry see Field 5D.
W76-12491

PAPER MILL WASTE SLUDGE OXIDATION AND PRODUCT RECOVERY,
Sterling Drug, Inc., New York. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12493

METHOD FOR TREATING HEMI CAUSTIC EFFLUENTS,
ITT Industries, Inc., New York.
For primary bibliographic entry see Field 5D.
W76-12495

IMPROVEMENTS TO PROCESSES FOR PURIFYING EFFLUENTS ORIGINATING FROM THE MANUFACTURE AND BLEACHING OF CHEMICAL OR SEMICHEMICAL PAPERMAKING PULPS (PERFECTIONNEMENT AUX PROCEDES D'EPURATION DES EFFLUENTS PROVENANT DE LA FABRICATION ET DU BLANCHIMENT DES PATES A PAPIER DITES CHIMIQUES OU SEMI-CHIMIQUES),
For primary bibliographic entry see Field 5D.
W76-12498

PROCESS FOR PRECLEANING INDUSTRIAL WASTE WATER RESULTING FROM THE PROCESSING OF WATER-SOLUBLE PHENOLIC RESINS OR UREA-FORMALDEHYDE RESIN SOLUTIONS (VERFAHREN ZUR VORREINIGUNG VON BEI DER VERARBEITUNG VON WASSERLOESLICHEN PHENOLISCHEN RESOLEN ODER VON HARNSTOFF-FORMALDEHYDHARZLOESUNGEN ANFALLENDEM INDUSTRIEABWASSER),
For primary bibliographic entry see Field 5D.
W76-12504

3F. Conservation In Agriculture

ECONOMIC COSTS OF CONTROLLING WATER QUALITY THROUGH MANAGEMENT OF IRRIGATION RETURN FLOWS,
Washington State Univ., Pullman. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12218

WATER PRODUCTION FUNCTIONS AND PREDICTED IRRIGATION PROGRAMS FOR PRINCIPAL CROPS AS REQUIRED FOR WATER RESOURCES PLANNING AND INCREASED WATER USE EFFICIENCY,
California Univ., Davis. Dept. of Water Science and Engineering.
J. I. Stewart, R. M. Hagan, and W. O. Pruitt.
Final Report No. 14-06-D-7329, July 1976. 80 p, 17 fig, 18 tab, 17 ref. USBR 14-06-D-7329.

Descriptors: Irrigation programs, Water requirements, Optimization.
Identifiers: *Evapotranspiration, Crops, Beans, Planning, *Irrigation efficiency, Crop production, Water supply, Alfalfa, Grain sorghum, Water utilization.

1973 was a 'payoff' year in that procedures developed with corn in the 1969-72 period enabled gathering of all desired data for pinto beans in the single year, as well as finalizing information for grain sorghum. Alfalfa studies constituted the first year with a perennial crop having an established root system. Nevertheless, this experiment also provided information useful for practical water use planning. Principal developments for pinto beans, grain sorghum, and (earlier) corn are: (1) Yield versus evapotranspiration (ET) functions which quantify minimum yield loss expectations at all ET deficit levels. In relative value form these functions are transferable for guidance of several kinds of crop and water management decisions at other sites. Their use to select among crops for profit maximization in differing water supply circumstances is illustrated. (2) Determination of sensitivities of crop growth stages to ET deficits. (3) Methods of estimating expected ET deficits in different cropping circumstances. (4) Two models which utilize estimates of anticipated ET deficits and growth stage sensitivities to predict actual ET and yield for the season. Alfalfa soil water uptake patterns are used to illustrate calculation frequencies required to satisfy ET demands, based on soil depth and water holding capacity. (Bureau of Reclamation)
W76-12236

EVERY-OTHER FURROW IRRIGATION OF CORN,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
P. E. Fischbach, and H. R. Mulliner.
Transactions of the American Society of Agricultural Engineers, Vol. 17, No. 3, p. 426-428, May-June 1974. 4 tab, 9 ref.

Descriptors: *Corn(Field), *Irrigation practices, Irrigation effects, *Irrigation efficiency, *Furrow irrigation, Surface irrigation, Agriculture, Water conservation.

Every-other furrow irrigation was compared with every furrow irrigation on several soil types in Nebraska under various rainfall conditions. Analysis of the data shows no significant differences at the 5 percent level in corn grain yields on any soil texture when comparing every-other furrow with every furrow irrigation using 2 1/3 to 12-hr. irrigation sets. Further analysis of the data shows that the irrigation water moves laterally from the irrigated furrow to the adjacent dry furrow to a depth of 3 feet even with a 2 1/3-hr. irrigation set. Therefore, both manually and automated irrigation systems can be designed for every-other furrow irrigation. (Skogerboe-Colorado State)
W76-12371

SAMPLING AND CALCULATION METHODS FOR DETERMINING QUANTITIES OF NITROGEN AND PHOSPHORUS IN WATERSHED RUNOFF,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 5A.
W76-12372

FUNDAMENTALS OF PROGRAMMED SOIL MOISTURE DEPLETION,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
D. W. Fonken, and P. E. Fischbach.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. 4 fig, 11 ref.

Descriptors: *Scheduling, Soil moisture, Water utilization, Irrigation, Irrigation practices, Irrigation operation and management, Energy.
Identifiers: *Soil moisture depletion, *Irrigation scheduling.

Programmed soil moisture depletion is an irrigation scheduling policy for achieving improved water use efficiency and energy savings. It requires medium or fine textured soils, irrigation hardware that can apply small controlled amounts of water, a climate and/or irrigation supply which can provide off-season rainfall and irrigation, and a relatively high level of irrigation management. It is recommended as a technique to reduce peak season irrigation requirements by utilizing previously wasted rainfall and off-season irrigation capability. (Skogerboe-Colorado State)
W76-12373

SPRINKLER IRRIGATION DESIGN CRITERIA FOR SUGAR BEETS,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
D. W. Fonken, J. C. Steele, and P. E. Fischbach.
Transactions of the American Society of Agricultural Engineers, Vol. 17, No. 5, p 889-891, September-October 1974. 5 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Irrigation design, Irrigation practices, *Design criteria, *Sugar beets, Consumptive use, *Nebraska, Crop response.

A solid set sprinkler system was used to simulate center pivot sprinklers in a search for the smallest design capacity which would not reduce yields of irrigated sugar beets. The peak daily consumptive use of sugar beets in western Nebraska is about 0.33 in. per day. A system with the capacity to supply this amount to the crop would need a capacity in excess of 0.33 in. per day to allow for water losses. The results indicate that systems that can apply 0.20 in. per day, without allowing for water losses, are sufficient to produce sugar beets in western Nebraska without incurring a reduction in yield. (Skogerboe-Colorado State)
W76-12374

FILTER ESPECIALLY INTENDED FOR FILTERING NATURAL WATER FOR THE IRRIGATION OF CULTIVATED FIELDS,
B. L. Legras.
U. S. Patent No. 3,959,140, 6 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1741, May 25, 1976.

Descriptors: *Patents, +Irrigation, *Irrigation practices, *Filtration, *Irrigation efficiency, Application equipment, Water delivery, *Filters, Screens, Water quality control.

A cleansable filter intended for filtering natural water for the irrigation of cultivated fields is described. The filter comprises a cylindrical body, a filtering element mounted inside the body and defining in the interior two concentric chambers, one communicating with the exterior through a drainage valve, and also through one of two lateral openings in the body. The other annular chamber encloses the first chamber and connects with the exterior through the other lateral opening. The filter also has a brush mounted coaxially in the first chamber. The brush rotates manually or automatically to remove all foreign bodies from the inner wall of the first chamber. Water enters the annular chamber through a lateral opening, passes into the first cylindrical chamber and through the filtering elements from the interior to the exterior, and leaves by the second lateral opening. Foreign matter can be evacuated by opening the drainage valve. Alternatively, the brush may be driven by a device responsive to the pressure differences between the two chambers, the drainage valve being automatically opened at the same time. (Sinha - OEIS)
W76-12400

OPTIMIZATION OF DESIGN CAPACITY OF AN AQUEDUCT,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4A.
W76-12526

BAYESIAN APPROACH TO TILE DRAIN DESIGN,
Ecole Polytechnique Federale de Lausanne (Switzerland). Dept. of Agriculture.
For primary bibliographic entry see Field 8B.
W76-12527

MANAGEMENT OF WATER RESOURCES UNDER DIFFERENT SOCIO-ECONOMIC CONDITIONS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6B.
W76-12626

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

OPTIMIZATION OF REAL TIME DAILY OPERATION OF A MULTIPLE RESERVOIR SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
W. W-G. Yeh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 515, $7.50 in paper copy, $3.00 in microfiche. Report No. UCLA-ENG-7628, April 1976. 167 p, 3 fig, 16 tab, 29 ref, 1 append. OWRT C-5184(4208)(4).

Descriptors: *Reservoir operation, Hydroelectric power, *Optimization, *Linear programming, *Dynamic programming, Systems analysis, Streamflow forecasting, Operations research, California, *Multiple-purpose reservoirs, *Decision making.
Identifiers: *California Central Valley Project, Real-time decision making.

A practical optimization model was developed for the optimal real time daily operation of the California Central Valley Project (CVP). The CVP water and power facilities considered in the study include 9 storage or regulating reservoirs or forebays, 7 powerplants, 3 pumping plants and 2 facilities which can be used either for power generation or pumpback operations. The CVP performs a number of water resource management activities which include irrigation, hydroelectric power generation, flood control, fish and wildlife enhancement, navigation, recreation, and water quality control. An iterative linear programming model was developed for the determination of optimal daily releases through the CVP facilities. The objective function used was the minimization of theloss of stored potential energy in the system while the cost coefficients associated with the linear programming formulation are related to energy generation characteristics and reservoir and powerplant configuration. A dynamic programming algorithm was also developed which imbeds the linear programming solutions for an overall optimization. The model developed is being implemented for on-line use to assist the CVP managers in their daily decision making.
W76-12155

PLANNING THE LOCATION AND CAPACITY OF FLOOD CONTROL STRUCTURES,
Cornell Univ., Ithaca, N. Y. Coll. of Engineering.
M. O. Ball, W. F. Bialas, and D. P. Loucks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 480, $5.50 in paper copy, $3.00 in microfiche. Technical Report No. 101, Water Resources and Marine Sciences Center, Cornell University, Ithaca, New York, June 1976. 98 p, 3 fig, 2 tab, 9 ref, append. OWRT C-5240 (4230)(3).

Descriptors: *Water resources, *Flood control, *Flood routing, *Planning, *Cost analysis, Optimization, Flood peak, Flood plains, Storage, River basins, Methodology, Equations, Systems analysis, Mathematical models, Evaluation, Design.
Identifiers: *Cost effectiveness, Branch and bound backtracking routine, *Muskingum flood routing procedure.

The Muskingum flood routing procedure together with a branch and bound backtracking optimization routine are used to evaluate alternative capacities and locations of various flood control structures required to protect a flood plain from a specified design flood. This paper describes this preliminary planning procedure and illustrates its use for estimating cost-effective combinations of flood storage capacities in reservoirs, temporary flood storage basin capacities, levee locations and heights, and increased channel capacities in river basin systems. Computational efficiency is necessary if the procedure is to be used many times to estimate the costs required to protect various regions in the flood plain from various design floods and to determine the required accuracy of various economic, hydrologic and design parameters for use in more detailed planning studies. The model developed can be extended to include a distribution of floods rather than a single design flood. This would permit an estimation of the cost of simultaneously providing different levels of flood protection to different regions in the flood plain. (Bell-Cornell)
W76-12156

REVEGETATING DEVASTATED SITES IN NEW MEXICO WITH WESTERN WHEATGRASS TRANSPLANTS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
For primary bibliographic entry see Field 4C.
W76-12161

A STUDY OF THE UTILIZATION OF ERTS-1 DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.
W76-12183

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST SERVICES IN THE CONNECTICUT RIVER BASIN,
National Weather Service, Silver Spring, Md. Office of Hydrology.
H. J. Day, and K. K. Lee.
NOAA Technical Memorandum NWS HYDRO-28, February 1976. 52 p, 16 fig, 9 tab, 11 ref.

Descriptors: *Connecticut, *Vermont, *Massachusetts, Connecticut River, *Flood damage, *River forecasting, Hydrologic data, Flood plains, Warning systems, Classification, Cost-benefit ratio, Topography mapping, Flood protection.
Identifiers: *Flood damage reduction potential, *River forecast services, *Connecticut River basin, Flood plain management, Reducible damage, Flood damage centers, Topographic data collection.

Four carefully selected communities in the Connecticut River Basin were studied for flood damage reduction. Properties on the flood plain were classified into residential, commercial, industrial and automobile categories. Stage damage assessments were made for those categories for four situations: no warning, limited warning time, maximum practical evacuation, and floodproofing of one-story houses. The investigation found that approximately $750,000 of reducible damages could be expected on commercial and residential elements of the flood plain. Industrial structures were classed in the same order of magnitude as residential and commercial structures. Total basin-wide reducible damages exceeded $1,500,000 per year. The 1976 cost of the National Weather Service for providing river forecasts throughout the basin was approximately $75,000. It was estimated that a total of $200,000 per year was adequate to provide forecast services associated with reducible damages. (Roberts - ISWS)
W76-12186

SUPERCRITICAL FLOW AT OPEN-CHANNEL JUNCTIONS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 8B.
W76-12187

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
J. P. Carter, H. G. Poulos, and J. R. Booker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 450, $3.50 in paper copy, $3.00 in microfiche. Research Report No. R256, December 1974. 18 p, 7 fig, 1 tab, 7 ref.

Descriptors: *Embankments, *Earth dams, *Seepage, *Deformation, Soil water, Soil water movement, Drainage, Drainage practices, Soil stability, Soil stabilization, Soil mechanics, *Finite element analysis, Membranes, Mathematical studies, Impervious membranes, Dams, Pore pressure, Movement.
Identifiers: *Embankment deformations, Drainage blanket, Homogeneous dam.

A finite element analysis was made of the movements in an embankment due to water loading, taking account of seepage through the embankment. The effects on deformations of drainage within the embankment and of a central core were investigated for an embankment resting on a rigid base. It was found that the long-term deformations due to water loading may be considerably affected by the pattern of steady state flow, and hence by the provision of drainage within the embankment. Larger horizontal movements were developed when seepage occurred than if an impermeable membrane existed on the upstream face. The modulus of the core relative to the shells also had a significant effect on movements. (Sims - ISWS)
W76-12188

SOME ASPECTS OF STOCHASTIC RESERVOIR THEORY,
Monash Univ., Clayton (Australia).
R. M. Phatarfod.
Journal of Hydrology, Vol. 30, No. 3, p 199-217, July 1976. 5 tab, 18 ref.

Descriptors: *Stochastic processes, *Reservoirs, *Mathematical models, *Simulation analysis, Draft-storage curves, Probability, Inflow, Statistical models, Statistics.
Identifiers: *Stochastic reservoir theory, Draft relationship, Simulation techniques, Gamma Markov sequences, Random-walk techniques, Reservoir size, Inflow distribution, Constant draft ratio.

The problem of the reservoir size-reliability-draft relationship is examined. It compared the mathematician's analytical efforts with the simulation techniques of the engineers and hydrologists and suggested that the two methods should complement each other. The various models for generating gamma Markov sequences were looked at, and a new model which was analytically more suitable to the problem in question was suggested. An alternative to the traditional formulation of the problem in terms of probability of failure was suggested, and a method based on random-walk techniques was employed to give close approximations. The effects of various parameters of the in-

flow distribution on the reservoir size to give the same reliability for a constant draft ratio were discussed. (Roberts - ISWS)
W76-12197

DISCHARGE PREDICTION, PRESENT AND FORMER, FROM CHANNEL DIMENSIONS,
Wisconsin Univ., Madison. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-12198

SEA LEVEL COMPUTATIONS OF THE BALTIC WITH A 20-CANAL MODEL,
Fishery Board of Sweden, Goteborg. Hydrographic Dept.
For primary bibliographic entry see Field 2L.
W76-12205

REFORM OF ILLINOIS WATER RESOURCE LAWS WITH PARTICULAR REFERENCE TO THE DRAINAGE CODE AND CLOSELY RELATED LAWS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W76-12217

WABASH RIVER SYSTEMS MODEL - TERMINAL REPORT PHASE I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
G. H. Toebes, C. Rukvichae, and T. A. Sullivan.
Available from the National Technical Information Service, Springfield, VA 2216! as PB-257 489, $5.00 in paper copy, $3.00 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 76, July 1976. 90 p, 12 fig, 4 tab, 6 append. OWRT A-026-IND(5).

Descriptors: *Reservoir operation, Management, *Reservoir releases, Recreation, Flow control, Flow augmentation, Flood control, Reservoir stages, Reservoir storage, Multiple purpose reservoirs, Simulation analysis, Model studies, *Indiana.
Identifiers: *Reservoir operating policy, Routing models, *Wabash River systems model.

A daily simulation model is presented for the Upper Wabash River and Reservoir System in Indiana. The motivation for this work was to apply systems approaches to surface water planning and management facets for a major river in the state of Indiana. The core of the project was the building of river-reservoir simulation software including reservoir operating policy rules and to do so for a 24 hour time step. The construction of the simulation model, the different operating policies used, a discussion of benefit estimation, and the software documentation have been detailed in five previous reports. (See also W74-12197; W74-12196; W73-07815; W73-04628 and W72-13301) This report contains a brief summary of the materials found in the earlier publications; however its major purpose is to record some over-all conclusions. Presented are views for future research and the benefits that may be derived from this work. Additional work on programs, particularly on data base organization, access, editing and documentation, is given.
W76-12220

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARM WATER SPORT FISH IN IOWA: SUBPROJECT I INVENTORY OF MAJOR STREAM ALTERATIONS IN IOWA,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12234

WATER PRODUCTION FUNCTIONS AND PREDICTED IRRIGATION PROGRAMS FOR PRINCIPAL CROPS AS REQUIRED FOR WATER RESOURCES PLANNING AND INCREASED WATER USE EFFICIENCY,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3F.
W76-12236

SHADOW LENGTH TABLES FOR ENVIRONMENTAL PLANNING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Report PSW-102, 1974. 6 p, 2 tab.

Descriptors: Snow management, Planning, Solar radiation, Water management(Applied), Heat, Light, Insolation, Reproduction, *Forest management, Light intensity.
Identifiers: Shadow length tables, Solar light, Solar heat.

Presented are the rationale for using shadows in environmental control; calculation techniques for specific latitudes, dates, aspects and slopes; instructions on using shadow length in planning; and examples of the application of the tables to snowmelt management. Separately, eight sets of tables are available for latitudes 36 degrees north to 50 degrees north in increments of 2 degrees. Each set covers one latitude, 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22, the shortest day of the year, to June 22, the longest. (Forest Service)
W76-12240

CONTROLLING SOLAR LIGHT AND HEAT IN A FOREST BY MANAGING SHADOW SOURCES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
Halverson, G. Howard, and James L. Smith.
USDA Forest Service Research Paper PSW-102, 1974. 14 p, 5 fig, 7 ref.

Descriptors: *Forest management, Light, Heat, Insolation, Data collections, Plant growth, Reproduction, *Light intensity, *Solar radiation, Snow management, Planning.
Identifiers: *Solar light, *Solar heat, Shadows, Sunlight.

Control of solar light and heat to develop the proper growth environment is a desirable goal in forest management. The amount of sunlight and heat reaching the surface is affected by shadows cast by nearby objects, including trees. In timbered areas, the type of forest management practiced can help develop desired microclimates. The results depend on the size and orientation of openings created and on the shade cast by surrounding vegetation. A computerized method to calculate the extent of boundary shading for any combination of date, slope, and aspect between 23.45 degrees N. latitude and 50 degrees N. latitude is described. Shadow-length tables provide coverage for the contiguous United States in increments of 2 degrees from 36 degrees N latitude to 50 degrees N latitude. By extrapolation, the tables can be used from the Mexican to the Canadian border. (Forest Service)
W76-12241

SHADOW LENGTH TABLES FOR LATITUDE 42 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applight), Light, *Data collections, *Forest management, Reproduction, Insolation, Solar radiation.
Identifiers: *Shadow length tables.

A set of tables for latitude 42 degrees north, covers, 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12242

SHADOW LENGTH TABLES FOR LATITUDE 50 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light, Reproduction, Insolation, Solar radiation, *Latitudinal studies, *Data collections, *Forest management.
Identifiers: *Shadow lengh tables.

A set of tables for latitude 50 degrees north covers, 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12243

SHADOW LENGTH TABLES FOR LATITUDE 44 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light, Insolation, Reproduction, Solar radiation, *Forest management, *Data collections, *Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 44 north, covers 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12244

SHADOW LENGTH TABLES FOR LATITUDE 46 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water managemant(Applied), Light, Insolation, Solar radiation, Reproduction, *Forest management, *Data collections, *Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 46 degrees north covers 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12245

SHADOW LENGTH TABLES FOR LATITUDE 48 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light, Reproduction, Solar radiation, Insolation, *Forest management, *Data collections, *Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 48 degrees north, covers 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12246

SHADOW LENGTH TABLES FOR LATITUDE 38 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light, Insolation, Reproduction, Solar radiation, *Forest management, *Data collections, *Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 38 degrees north covers 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12247

SHADOW LENGTH TABLES FOR LATITUDE 40 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light, Insolation, Reproduction, Solar radiation, *Data collections, *Forest management, *Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 40 degrees north covers 25 aspects, and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12248

SHADOW LENGTH TABLES FOR LATITUDE 36 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. G. Halverson, and J. L. Smith.
Forest Service-PSW-102, 1974. 49 p, 175 tab.

Descriptors: Snow management, Planning, Water management(Applied), Light. Insolation, Reproduction, Solar radiation, *Data collections, *Forest management, Latitudinal studies.
Identifiers: *Shadow length tables.

A set of tables for latitude 36 degrees north covers 25 aspects and seven dates during the year. Aspect refers to a dual-angle method of description that includes both slope and aspect. Dates range from December 22 to June 22. (Forest Service)
W76-12249

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-12250

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
M. E. Davis, and A. L. Knight.
Alabama Geological Survey, University, Map 126, 1972. 9 p, 3 fig, 1 map, 1 tab, 11 ref.

Descriptors: *Surface water availability, *Streamflow, *Water yield, *Water quality, Chemical analysis, Runoff, Average flow, Low flow, Hydrologic data, Maps.
Identifiers: Pickens County(Ala).

The average annual runoff originating in Pickens County, Alabama, is about 18 inches or 0.84 million gallons per day (mgd) per square mile. The Tombigbee and Sipsey Rivers, where they join, have average flows of about 5,600 mgd and 700 mgd, respectively, and median annual 7-day low flows in excess of 350 mgd and 45 mgd, respectively. Lubbub, Bear, and Coal Fire Creeks have average flows that exceed 100 mgd at their mouths and median annual 7-day low flows of 9 mgd or greater in their lower reaches. The dissolved-solids content of surface water (estimated from specific conductance values) is less than 50 mg/liter except in the Tombigbee River where the dissolved-solids content generally is less than 75 mg/liter. The water is soft and the chloride content generally is less than 10 mg/liter. (Woodard-USGS)
W76-12280

WATER AVAILABILITY OF MONROE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
J. C. Scott, M. E. Davis, J. F. McCain, and H. M. Whitman.
Alabama Geological Survey, University, Map 132, 1972. 30 p, 5 fig, 2 maps, 5 tab, 16 ref.

Descriptors: *Water resources, *Available water, *Surface waters, *Groundwater, *Water quality, Water supply, Water utilization, Water yield, Streamflow, Flow rates, Aquifer characteristics, Hydrologic budget, Maps.
Identifiers: Monroe County(Ala).

The principal sources of ground water presently being utilized in Monroe County, Alabama, are the Nanafalia aquifer in the northern and central parts of the county and the Miocene-Pliocene aquifer in the southern part. These aquifers are capable of yielding from 0.2 to 1.0 million gallons per day (mgd) or more per well. Potential sources of ground water not presently being utilized are the Ripley aquifer in the northeastern part of the county and the Eocene-Oligocene aquifer in the southern part. These aquifers are capable of yielding as much as 1.0 mgd per well. An average of about 315 mgd of water is recharged to groundwater reservoirs in the county annually. The Alabama River, the largest source of surface water, has an average flow of about 20,500 mgd and a 7-day low flow of about 5,750 mgd at Claiborne. The Little River and Big Escambia, Lovetts, Randons, Limestone, and Big Flat Creeks are also potential sources of large quantities of water. These streams have average flowsin excess of 50 mgd and 7-day low flows in excess of 2 mgd in their lower reaches. Average runoff into streams in the county is about 0.95 mgd per square mile of drainage area. Ground water generally is soft but the dissolved-solids content exceeds 1,000 mg/liter in some parts of the county, and locally the iron content exceeds 0.3 mg/liter. Surface water is soft and generally contains less than 100 mg/liter dissolved solids. Water use in 1967 in Monroe County was about 2.8 mgd, which is less than 1 percent of the total water available. (Woodard-USGS)
W76-12281

GUIDE TO THE AVAILABILITY OF HYDROLOGIC DATA, GREATER PITTSBURGH REGION, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12282

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
N. C. Koch, and W. Bradford.
South Dakota Geological Survey, Vermillion, Bulletin 25, 1976. 53 p, 29 fig, 6 tab, 24 ref, append.

Descriptors: *Water resources, *Water quality, *Aquifer characteristics, *Surface waters, *South Dakota, Water wells, Water yield, Water utilization, Water level fluctuations, Streamflow, Flow rates, Floods, Groundwater recharge, Chemical analysis, Water analysis, Hydrogeology.
Identifiers: Brown County(S Dak).

Brown County, an agricultural County in northeastern South Dakota, has an area of 1,683 sq mi. Glacial outwash is an important water-bearing deposit in Brown County. Such deposits contain three major aquifers, the Deep James, Middle James, and Elm. Where 40 ft or more thick, these aquifers can provide yields of 500 gpm or more. The quality of water from aquifers above the bedrock surface varies from good to very poor for irrigation use. Recharge to these glacial drift aquifers is by infiltration and percolation of snowmelt and precipitation through overlying materials and by subsurface inflow from Spink and Marshall Counties. The major bedrock aquifers thus far developed are in the Dakota, Fall River, and Sundance Formations. Wells tapping these aquifers are from 850 to 1,450 ft deep. Water from the Sundance aquifer recharges the Fall River aquifer which in turn recharges the Dakota aquifer. The chemical quality of water from the Dakota, Fall River, and Sundance aquifers varies from fair to poor. Most streamflow, and any flooding, in Brown County occurs in the spring and early summer from snowmelt and precipitation. Except for the Elm River, most streams commonly have no flow in the late summer, fall, and winter. The James River between Columbia and Stratford loses water at an average rate of 3,000 acre-ft per year by evaporation. During major flooding from 1950 to 1970 five periods of major stream loss occurred, ranging from 16,000 to 40,000 acre-ft. The dissolved solids concentration of water from streams during periods of high flow may be less than 300 mg/liter, but during periods of low flow it may be more than 2,000 mg/liter. (Woodard-USGS)
W76-12290

FLOOD DISCHARGE OF STREAMS IN NEW MEXICO AS RELATED TO CHANNEL GEOMETRY,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W76-12294

RESPONSE OF WATER-HYACINTH TO LASER RADIATION,
Oral Roberts Univ., Tulsa, Okla. Dept. of Natural Sciences.
R. Couch, and E. O. Gangstad.
Weed Sci. 22(5), p 450-453, 1974.

Descriptors: *Water hyacinth, *Radiation, Leaves, Photosynthesis, Growth rates, Plant growth, Translocation, *Aquatic weed control.
Identifiers: Eichhornia-Crassipes, *Laser radiation.

Waterhyacinth (Eichhornia crassipes (Mart.(Solms.) was partially controlled with 10.6 nm laser radiation. Radition levels of < 1 J/cm2 for individually irradiated plants and 69 J/cm2 for group-irradiated plants significantly inhibited growth. Photosynthesis in treated plant-leaf tissue was inhibited about 50% by an exposure level of 4 J/cm2. 14C-labeled compounds fixed by plantleaf tissue following laser treatment were found to be

normally distributed.--Copyright 1974, Biological Abstracts, Inc.
W76-12406

ALLOWANCE FOR THE STOCHASTIC CHARACTER OF HYDROLOGICAL DATA IN WATER PROJECT DECISIONS,
National Water Authority, Budapest (Hungary). Engineering Secretariat.
For primary bibliographic entry see Field 7A.
W76-12439

A SNOWMELT RUNOFF MODEL AND ITS APPLICATION TO SHORT-RANGE FORECASTING OF FLOOD DISCHARGES,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2C.
W76-12440

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-12442

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8F.
W76-12456

IMPACT OF HURRICANE TIDAL SURGES ON SUBSEQUENT LAND USE CHANGES AND WATER RESOURCES REALLOCATION,
University of Southern Mississippi, Hattiesburg. Dept. of Geography and Area Development.
R. D. Cross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 840, $4.50 in paper copy, $3.00 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 54 p, 5 fig, 11 tab, 10 ref. OWRT A-095-MISS(1).

Descriptors: Water distribution(Applied), *Hurricanes, *Surges, *Land use, Tidal waters, Tidal effects, Gulf of Mexico, *Mississippi, Coasts, Gulf Coastal Plain, Water demand, Water quality.
Identifiers: *Hurricane Camille(1969), Water resources reallocation, *Tidal surges.

The purpose was to assess the impact of the tidal surge of Hurricane Camille on the land use changes on the Gulf Coast of Mississippi and to determine the water resources reallocations. Single-family residences least likely to regenerate in the coastal part of the surge zone, but residential property was the fastest growing land use further inland in the surge zone. Land use for commercial establishments, which are transportation oriented, was most likely in the most storm-prone part of the surge zone. Increasing population densities in the surge zone and the growth of industry were major factors increasing the water demand and contributing to deteriorating water quality.
W76-12461

SATELLITE SNOW OBSERVATIONS AND SEASONAL STREAMFLOW FORECASTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2C.
W76-12468

WINDBREAKS MAY INCREASE WATER YIELD FROM THE GRASSLAND ISLANDS IN ARIZONA'S MIXED CONIFER FORESTS,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-12477

ECONOMIC UNCERTAINTIES IN WATER RESOURCES PROJECT DESIGN,
Eotovs Lorand Univ., Budapest(Hungary).
For primary bibliographic entry see Field 6A.
W76-12514

A DYNAMIC REGIONAL MODEL FOR EVALUATING RESOURCE DEVELOPMENT PROGRAMS,
Manitoba Univ., Winnipeg. Dept. of Agricultural Economics.
F-L. Tung, J. A. MacMillan, and C. F. Framingham.
American Journal of Agricultural Economics, Vol. 58, No. 3, p 403-414, August 1976. 1 fig, 3 tab, 34 ref.

Descriptors: *Resources development, Economics, *Simulation analysis, Evaluation, *Regional analysis, Drainage, Water, Land clearing, Income distribution, Effects, Governments, Mathematical models, Equations, Systems analysis, *Canada.
Identifiers: Development programs, *Interlake Area(Manitoba).

The usefulness of a dynamic regional economic model for evaluating resource development programs is described and demonstrated. The model results indicate that without development programs, land may constrain livestock production after 1976. The growth in crop production is demand determined and will not exceed available land. A labor requirement of 15,400 man-years is projected for 1976 with 2,600 unutilized. Output and income distribution effects of drainage, training, and land-clearing development programs are assessed for the Interlake Area of Manitoba. (Bell-Cornell)
W76-12520

WATER YIELD MODEL USING SCS CURVE NUMBERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 2A.
W76-12522

STRUCTURAL MODEL STUDIES FOR THE HENDRIK VERWOERD DAM,
Wimpey (George) and Co. Ltd., Hayes (England). Wimpey Central Lab.
For primary bibliographic entry see Field 8A.
W76-12523

OPTIMIZATION OF DESIGN CAPACITY OF AN AQUEDUCT,
California Univ., Berkeley. Lawrence Berkeley Lab.
J. Sathaye, and W. A. Hall.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 102, No IR3, p 295-305, September 1976. 3 tab, 1 fig, 11 ref.

Descriptors: *Aqueducts, *Irrigation, *Optimization, *Mathematical models, Design, Planning, Water allocation(Policy), Dynamic programming, Constraints, Methodology, Equations, Systems analysis.
Identifiers: Benefit maximization, Demand functions, Computer programs, Design capacity.

A methodology is presented for determining the proper allocation of water to the various consumers along an aqueduct under varying demand conditions such that the net benefit obtained is maximum. With these allocations, the aqueduct capacity required between diversions is determined. The methods are highly suitable for optimum analysis in development planning situations. Two deterministic analytical models using dynamic programming are presented. The first model considers the problem with simultaneously peaking demand functions; the second model removes this constraint from the demand functions. The results provide the optimum sizes of the aqueduct reaches for a given quantity of available water. (Bell-Cornell)
W76-12526

BAYESIAN APPROACH TO TILE DRAIN DESIGN,
Ecole Polytechnique Federale de Lausanne (Switzerland). Dept. of Agriculture.
For primary bibliographic entry see Field 8B.
W76-12527

FLOOD-HAZARD EFFECTS ON RESIDENTIAL PROPERTY VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W76-12529

A LEGAL-HISTORICAL ANALYSIS OF NAVIGATION USER CHARGES,
Department of Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 6E.
W76-12532

EVALUATING TISZA RIVER BASIN DEVELOPMENT PLANS USING MULTIATTRIBUTE UTILITY THEORY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
R. L. Keeney, E. F. Wood, L. David, and K. Csontos.
Collaborative Publication report, CP-76-3, International Institute for Applied Systems Analysis, Laxenburg, Austria, March 1976. 24 p, 5 fig, 4 tab, 17 ref.

Descriptors: *Water resources development, *River basins, *Alternative planning, *Decision making, Optimum development plans, Long-range planning, Evaluation, Equations, Assessment, Inter-basin transfers, Reservoirs, Mathematical models, Systems analysis, Risks.
Identifiers: *Tisza River basin(Hungary), *Utility function, *Multiple objectives, Scaling factors.

Choosing among several development plans for the water resources of the Tisza River in Hungary is a complex problem, due to the multiple conflicting objectives, i.e., economic, environmental, social and technical considerations. This paper investigates the usefulness of multiattribute utility theory for evaluating alternative plans for water resources development in the Tisza basin. The result, which requires an explicit consideration of the tradeoffs among attributes, is a cardinal evaluation of the alternatives. This indicates how much better one alternative is than another as well as permits a sensitivity analysis of the tradeoffs. Also, the model is appropriate for explicitly including in a rigorous manner the uncertainties of the problem in the formal analysis. Five possible planning alternatives are described; next, twelve attributes that measure the degree to which the planning objectives are met are defined. A utility function over the twelve attributes is assessed and preliminary results indicate that building interbasin water transfers from the Danube or from small reservoirs in the northeast is to be preferred to developing the other three alternatives considered. (Bell-Cornell)
W76-12534

THE USE OF COMPUTER TECHNIQUES AND AUTOMATION FOR WATER RESOURCES SYSTEMS.
Economic Commission for Europe (UN), New York. Committee on Water Problems, Economic and Social Council.
For primary bibliographic entry see Field 6A.
W76-12535

PROFESSIONAL REQUIREMENTS OF MODERN WATER ENGINEERS INVOLVED IN RIVER BASIN MANAGEMENT UTILIZING CONTEMPORARY TOOLS,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
J. R. Hammond.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Volume II. p 7-10.

Descriptors: *River basins, *Management, Engineering, Decision making, Evaluation, Dynamic programming, Operations, Water policy, Water resources development, Planning, Mathematical models, *California.
Identifiers: Central Valley Project(Cal).

Accelerating demands on the world's limited water resources forces the water engineer to recognize the need for the avant garde professional, the individual who is able and willing to use modern tools to assist in making complex and crucial decisions. This paper describes a case study within the Central Valley Project in California and then hypothesizes a description of the education, experience, and personality of the professional water engineer needed for modern river basin management. Discussed is the use of a state incremental dynamic programming model to determine optimal operating policy. (See also W76-12535) (Bell-Cornell)
W76-12537

TECHNIQUES OF SIMULATION FOR HYDROLOGIC COMPUTATION, IN QUANTITY AND QUALITY, OF INTEGRATED WATER RESOURCES DEVELOPMENTS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Dept. of Fundamental Research Bureau.
For primary bibliographic entry see Field 6A.
W76-12539

USE OF SIMULATION MODELS FOR THE EVALUATION OF A REGIONAL WATER-RESOURCE SYSTEM,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 6A.
W76-12540

APPLICATION OF DYNAMIC PROGRAMMING IN FRAMING OPERATING RULES FOR A MULTI-PURPOSE DAM,
Societe Grenobloise d' Etude et d' Applications Hydrauliques (France).
D. Normand.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., 1974, Volume II, p 24-27.

Descriptors: *Water resources development, *Dams, *Multiple-purpose projects, *Dams, Optimization, Economics, Benefits, Costs, Annual, Algorithms, Storage, Decision making, Planning, Computers, Operations research, Mathematical models.
Identifiers: *Operating rules, *Economic production functions, Marginal values.

To determine the optimal dimensions of a development project, one relies on a cost-benefit analysis. In estimating the economic benefits one may expect to derive for a development project, one is to some extent dependent on the operating rules adopted for the scheme. It is important, therefore, to consider the 'optimal operational strategy' problem from the very start of the feasibility study. To define an optimal operating policy for a multi-purpose development scheme and calculate the mathematical expectanctany of the annual gain hoped for, the storage can be considered as a stock of raw material (water) which yields a short-term economic benefit and which competes with the long-term benefit to be derived from storage designed to meet requirements in future months. In comparing the respective advantages associated with the water supply and storage level, monetary values in the form of economic production functions are taken as the reference. This article considers economic production functions in the determination of marginal storage values, operating rules and average annual operating gain for a multi-purpose dam. The Decision-Hazard type problem to be solved utilizes dynamic programming to find the optimum operating strategy. (See also W76-12535) (Bell-Cornell)
W76-12541

DYNAMIC PROGRAMMING FOR DETERMINATION OF A STORM WATER OUTLET SYSTEM OF PIPES AND FLOOD-DAMPING DAMS,
Societe Grenobloise d'Etude et d' Applications Hydrauliques (France).
M. L. Darnige.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., 1974, Volume II, p 27-29.

Descriptors: *Water resources development, *Dynamic programming, *Storm water, *Outlets, Pipes, Dams, Flood control, Hydrographs, Storage, Discharge(Water), Opitimization, Metholodology, Upstream, Algorithms, Systems analysis.
Identifiers: *Cost minimization.

This short article considers finding the optimalcost and operation of an arterial catchment area outflow network. The first computation phase ends at the final point downstream, for which the upstream discharge index corresponding to minimal total cost is determined. In the second phase, the required development design discharge for each section and the associated storage capacities at each site are established from the index, working up the arterial system. In considereing the validity of the optimization method, it is commented that the method should be classed as heuristic, providing a solution of 'theoretically non-proven optimality,' which at best be taken only as optimal or near-optimal. (See also W76-12535) (Bell-Cornell)
W76-12542

A QUANTITATIVE MODEL FOR THE PLANNING OF SURFACE WATER RESOURCES: USE OF MIXED VARIABLE LINEAR PROGRAMMING,
Ardour-Garonne Agency, Toulouse (France), Programming Group.
D. Bortolet, R. Lohou, and D. Monges.
In: The use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Vol. II, p 43-48. 4 fig.

Descriptors: *Water resources, *Planning, *Surface waters, *Linear programming, *River basins, Computers, *Computer programs, Algorithms, Reservoirs, Demand, Storage, Construction, Scheduling, Constraints, Mathematical models, Systems analysis.

Presented is a linear programming model for dealing with the problem of keeping a minimum acceptable flow in a river basin in spite of irrigation. The actual problem to solve is the scheduling of the construction of reservoirs to satisfy irrigation demand with a given guarantee without river flows falling under the minimum acceptable flow and with a view to keeping the updated cost of the computer program to a minimum. In the methodology, first a demand and an offer curve are derived. Then, to linearize the program, the curves are cut into segments giving the cost function of capacity. A double micro-decomposed structure is derived which is used largely to minimize the occupied computer's store. The Branch and Bound algorithm is used to solve the mathematical programming problem. (See also W76-12535) (Bell-Cornell)
W76-12546

EXPERIENCES WITH MATHEMATICAL MODELS USED FOR WATER QUALITY AND QUANTITY PROBLEMS,
Rijkswaterstaat, The Hague(Netherlands), Data Processing Div.
For primary bibliographic entry see Field 6A.
W76-12548

RIVER SYSTEM MODELLING FOR OPERATIONAL FORECASTING,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
E. L. Peck.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 91-95. 6 ref.

Descriptors: *River systems, *Forecasting, *Hydrology, *Data processing, Operations research, Mathematical models, Parametric hydrology, Optimization, Computers.
Identifiers: Catchments.

Since the introduction of computers, river forecast offices have initiated methods to automate data collection and processing, forecast preparation, and the distribution of warnings and forecasts. A goal has been set to develop forecast procedures which maximize the usefulness of modern data acquisition and processing techniques and incorporate the use of a conceptual hydrological simulation model. Computer programs and techniques cover all phases of development, including the acquisitation , processing of basic data, the calibration of model parameters, and operational forecasting procedures. This article discusses basic data acquisition and processing, a conceptual catchment model, parameter optimization, future additions, field application, and program availability. (See also W76-12535) (Bell-Cornell)
W76-12550

SYSTEMS SIMULATION AS A TOOL FOR WATER RESOURCE PLANNING, INCLUDING QUALITATIVE ASPECTS,
Bureau of Reclamation, Denver, Colo. Research and Engineering Center.
K. O. Eggleston, J. D. Hendrick, E. A. Cristofano, and A. E. Gibbs.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 95-99.

Descriptors: Water resources, *Planning, *Colorado River, *Simulation analysis, *Salinity, Routing, Hydrology, River basins, Computers, Mathematical models, Systems analysis.

In the Colorado River, additional water utilization features are being constructed which will allow the total flow of the river to be diverted for usage. The increasing diversions and consumptive uses are increasing the natural salinity levels. To analyze this problem and to assist in planning salinity alleviation measures, a basin simulation model has been developed. This article discusses the model in terms of general capability and operation, relationships with basin features, hydrological relationships, and salinity routing. This approach allows the operator to interact with the system and utilize his experience and intuition, thereby solving efficiently complex problems pertaining to river basins. (See also W76-12535) (Bell-Cornell)
W76-12551

MATHEMATICAL SIMULATION AND OPTIMIZATION OF FLOOD CONTROL SYSTEMS,
Belorusskii Central Research Inst. for Water Resources, Minsk.
V. A. Khavitch.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. April 1974, Vol. II, p 126-129. 1 tab, 6 ref.

Descriptors: *Flood control, *Optimization, *Simulation analysis, Chezy equation, Constraints, Unsteady flow, Decision making, Design, Computers, Mathematical models, Systems analysis.
Identifiers: Cost minimization.

Flood control necessitates development of efficient systems which can provide preventive or operational control. Providing a passive protection from high waters, the former involve measures for building dikes and increasing the channel capacity, or both. The latter have an effect on active flood control and include regulating reservoirs to be filled and emptied depending on the flood flow. This paper discusses problems of applying mathematical simulation methods to optimization of a preventive control system which comprises a regulated channel and dike structures. The optimization procedures serve to determine system structure parameters which minimize annual total costs. In this case, it is appropriate to apply a scanning method which makes provisions for a simple algorithm and a possibility to find a global extreme irrespective of the function type. Model tests show that the optimal decisions may result not from combined channel improvement and dike construction only, but can involve one of these separate measures. (See also W76-12535) (Bell-Cornell)
W76-12554

SIMULATION MODEL OF THE QUANTITATIVE AND QUALITATIVE EVOLUTION OF WATER RESOURCES AT DIFFERENT POINTS OF A RIVER-BASIN (ORNE),
Financial Agency of the Basin 'Seine-Normandie', Paris(France). Water Resources Div.
M. Dargent, and F. Biesel.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 129-132.

Descriptors: *Simulation analysis, Water resources, *River basins, *Hydrologic aspects, Management, Forecasting, Computers, Data collections, Meteorology, Economics, Mathematical models.

The hydrological evolution of a large basin is of great physical complexity. The decision maker needs a simulation model which allows him to forecast physical consequences. This article discusses the need for such a management model and for preliminary studies necessary for the quantitative econometric exploitation of the model. The model capable of effecting the needed forecasts with sufficient precision should represent the essential elements of the hydrological cycle--the principal runoff lines of surface water, the flow laws of underground water tables, climatological phenomena, human consumption, discharges, pollution, and so on. The correct resolution of three categories of problems is essential to a quantitative econometric use of the model: (1) mathematical and computer aspects raise technical difficulties now under control; (2) the collection of natural data can be long and costly if one begins with nothing but poses no new technical problem; and (3) the probability quantification of climatic calendars used by the model raised a problem for statistical meteorology in a new way and necessitates studies of particular difficulty. The principal difficulty is not to be found in the new techniques, but in the determination of the conditions of regulation and use of the model. (See also W76-12535) (Bell-Cornell)
W76-12555

THE 'POLPOLE' MODEL: AN ATTEMPT TO ANALYSE THE WATER SYSTEM IN THE FINANCIAL AGENCY OF A FRENCH RIVER BASIN,
Financial Agency of the Basin 'Seine-Normandie', Paris (France).
P. F. Teniere-Buchot.
In: The Use of Computer Techniques and Automation for Water Resources System, Washington, D. C., April 1974, Vol. II, p 133-136.

Descriptors: *River basins, *Long-term planning, *Water resources development, *Water supply, *Water pollution control, Computers, Mathematical models, Simulation analysis, Operations research, Graphical methods, Forecasting.
Identifiers: *Seine-Normandie Basin(France).

Described is France's unique organization of Financial Agents of the Basin, administering the national inheritance in terms of resources and safeguarding quality. Royalties are paid by consumers and refunded to them in the form of subsidies designed to facilitate water resources development and water pollution control. Discussed is an analysis of the Seine-Normandie hydro-geographical Basin to facilitate the choice of long-term objectives by systematically investigating the various potential outcomes regarding water supplies and the increase or decrease in water pollution. The method used is the provisional structural analysis, an overall approach employing matricial procedures, the theory of graphs, and operational research. It is developed in seven phases: (1) inventory of the variables making up the system; (2) creation of a register of logical relations existing between variables; (3) creation of a basic relations register; (4) synthesis of decisional actions and planning; (5) creation of a system associated graph; (6) quantization of the graph; and (7) computer processing. Limited to a single objective, 'progress of pollution,' the Popole model analyses the yearly changes in some fifteen variables. (See also W76-12535) (Bell-Cornell)
W76-12556

THE APPLICATION OF MATHEMATICAL MODELS AND OPTIMIZATION TECHNIQUES IN PLANNING WATER SUPPLY AND WASTE WATER DISPOSAL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 6A.
W76-12560

ELABORATION AND USE OF A MATHEMATICAL MODEL TO FORECAST IN QUANTITY AND QUALITY, THE WATER DEMANDS OF VARIOUS SECTORS OF INDUSTRY,
Societe du Canal de Provence et d'Amenagement de la Region Provencale Le Tholonet, Aix-en-Provence (France).
For primary bibliographic entry see Field 6D.
W76-12562

OPTIMAL DEVELOPMENT PROGRAMME FOR REGIONAL WATER SUPPLY SYSTEMS,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-12563

SIMPLIFIED DECISION MODEL FOR NATIONAL WATER SUPPLY DEVELOPMENT,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-12564

CONSTRUCTION AND UTILIZATION OF COMPLEX MATHEMATICAL MODELS IN THE PLANNING OF THE OPTIMAL DEVELOPMENT OF LARGE HYDROGRAPHIC SYSTEMS AND RIVER BASINS,
Ecole Nationle Superieure des Mines de Paris, Fontainebleau(France). Center for Geological Information.
Y. Emsellem, P. Ramain, A. Dreyfus, and P. Hubert.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 177-180.

Descriptors: *Water resources development, *River basins, *Planning, Hydraulics, Optimization, Regional analysis, Forecasting, Simulation analysis, Costs, Mathematical models, Systems analysis.

Water is used to satisfy the needs of a set of groups and activities. Based on these needs, the necessary hydraulic projects are estimated and their finances calculated; financial transfers between activities and between groups are analyzed. On the basis of each possible objective set, a synthetic file is built; the comparison between synthetic files is used to clarify the choices. Optimization is difficult on a big scale; at the level of large basins, there is no optimal objective solution: there exists only one solution which is the best from a subjective viewpoint. A set of models and related operations built by the Delegation for Technical and Scientific Research are examined herein. Included are: regional segmentation; development plans; regional description; typology of the users, forecast model; hydraulic systems typology; simulation model; cost repartition model; and transfer analysis. (See also W76-12535) (Bell-Cornell)
W76-12566

FLOOD HAZARD ANALYSES FOR LOWER MARSH CREEK (INCLUDING SELECTED TRIBUTARIES), BANNOCK COUNTY, IDAHO.
Soil Conservation Service, Boise, Idaho.
Prepared for Bannock County, Idaho Department of Water Resources, Southeast Idaho Council of Governments, Portneuf Soil and Water Conservation District. July 1975. 28 p, 6 fig, 15 plates, 7 tab.

Descriptors: *Floods, *Flood profiles, *Idaho, Floodwater, *Streamflow forecasting, Flood forecasting, Peak discharge, Non-structural alternatives, Zoning, Control structures, Flood plains, Ice jams.
Identifiers: *Marsh Creek(ID), Goodenough Creek(ID), Walker Creek(ID), Birch Creek(ID), Dry CAnyon(ID), Bannock County(ID), Cottonwood Creek(ID), Bell Marsh Creek(ID), Downey(ID), Arimo(ID), 500 year flood, 100 year flood.

Flood plains in the study area are used primarily for agriculture, though there is some residential development which is expected to increase. Population within incorporated areas of Bannock County is about 900. Marsh Creek watershed is about 400 square miles of mountainous terrain. The gradient of Marsh Creek, a tributary of Portneuf River, is about 4.5 feet per mile and the creek has numerous small tributaries. Floods occur in winter and early spring when there is generally a moderate volume of water, the runoff lasts 5 to 8 days and debris and ice are carried by water to plug bridges and culverts. Floods also occur in late spring and summer after thunderstorms. These are generally of short duration with a small volume of runoff. Since 1911, 21 floods of note have occurred. The largest was in 1962. Future floods are predicted through the use of regression analysis to correlate watershed data with data from similar watersheds. For Marsh Creek the following peak flows are predicted for each recurrence interval: 500 year, 2,340 cubic feet per second; 100 year, 1,450 cfs; 50 year, 1,170 cfs; and 10 year, 630 cfs. For Dry Canyon the following figures were computed: 500 year, 4,730 cfs; 100 year, 1,610 cfs; 50 year, 890 cfs; and 10 year, 220 cfs. Along Marsh Creek the areas flooded will vary from 1030 acres

to 1,4890 acres depending on the predicted flow. Specific recommendations are made on flood plain use. Agriculture ctan continue to use flood plains, while industrial, commercial and residential uses should be restricted and buildings should be flood proofed. A combination of zoning codes and other regulations can be used to accomplish this. Structural means may be used in some locations. (Smith -North Carolina)
W76-12580

CLARKS CREEK FLOOD PLAIN STUDY, CATAWBA COUNTY, NORTH CAROLINA.
Soil Conservation Service, Raleigh, N. C.
Prepared for Catawba County, North Carolina, October 1975. 8 p, 2 fig, 50 plates, 2 append.

Descriptors: *Floods, *Flood profiles, *Floodways, *Flood plains, *North Carolina, Flood flow, Flood peak.
Identifiers: *Clarks Creek(NC), Catawba County(NC), Hickory(NC), Newton(NC), Maiden(NC), 10-year flood, 100-year flood.

Flood hazard areas have been identified in towns of Hickory, Maiden and Newton (NC). In the watershed, urban and commercial development covers 20 to 25% of the land. Most of the area is cropland, pastureland and woodland. Clarks Creek, which drains 65 square miles, is a tributary of South Fork River downstream from the study area. Located in the central Piedmont area of North Carolina, the stream flows through mostly gently rolling topography in the uplands and rather broad, flat flood plain adjacent to the stream. Numerous tributaries enter the stream. Since there is no streamgage in the area, data from hydrologically similar watersheds were used. Water surface profiles were determined for the 10-year flood, 100-year flood, and a large magnitude storm (14 inch rainfall) exceeding the 100-year flood. Seventy-six representative cross sections were surveyed. The 100-year flood was analyzed both with existing development conditions and estimated future development conditions. Photo strip maps of the flood plain and flood profiles are included. (Smith - North Carolina)
W76-12582

NORTHEASTERN UNITED STATES WATER SUPPLY STUDY, INTERIM REPORT, CRITICAL CHOICES FOR CRITICAL YEARS.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 6D.
W76-12584

FLOOD HAZARD ANALYSES REPORT: EAST BRANCH NIMISHILLEN CREEK, STARK COUNTY, OHIO.
Soil Conservation Service, Columbus, Ohio.
Prepared for the Ohio Department of Natural Resources, (Columbus), and Stark County, Ohio. October 1975. 18 p, 5 fig, 23 plates, 4 tab, 13 ref.

Descriptors: *Floods, *Streamflow forecasting, *Flood profiles, *Flood data, Peak discharge, Floodways, Flood protection, Non-structural alternatives, Warning systems, Control structures, *Ohio.
Identifiers: East Branch Nimishillen Creek(OH), Stark County(OH), 100 year flood, 25 year flood, Water surface profiles.

Stark County is characterized by a land use and economic base that is mainly agricultural. Projecting current development rates, by 1990 12% of the land area will consist of single family dwellings. The 1970 population was 372,000, a 9.4% increase over 1960. Some areas in the cities of Canton and Louisville are urbanizing rapidly. Gently rolling landscape contrasts with deep glacial valleys there is considerable evidence of glacial till composed of sand, silt, clay, and larger rocks. East Branch Nimishillen Creek drops from 6 to 15 feet per mile and has a drainage area of 41.4 square miles. Nearly all major floods are produced by winter and spring rains falling on saturated soil which is snow covered or frozen. The largest flood was in 1913, but damages are not known. Future flooding was predicted in this report by surveying the land and making a mathematical model of the watershed. Water surface profiles were computed for 25,50 and 100 year present condition flood and the 100 year future condition flood. Some of the 7 railroad and 23 highway bridges spanning the creek restrict flow. The 100 year event would cover 1,262 acres including 89 houses and 68 commercial buildings. A peak discharge of 8,047 cubic feet per second, along with water velocities up to 6.12 feet second are predicted. (Smith - North Carolina)
W76-12586

REPORT OF THE QU'APPELLE BASIN STUDY BOARD.
Saskatchewan Quappelle Basin Study Board, Regina.
For primary bibliographic entry see Field 5G.
W76-12587

MULTIPURPOSE COMPUTER FOR THE HONOLULU BOARD OF WATER SUPPLY,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4B.
W76-12589

FLOOD HAZARD INFORMATION: BACKLICK CREEK, VIOLET TOWNSHIP, FAIRFIELD COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
Prepared for the Ohio Department of Natural Resources, Columbus, and Violet Township, Ohio, 3 p, 1 fig, 2 plates. November 1972.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Ohio, Zoning, *Flood plain zoning.
Identifiers: *Blacklick Creek(OH), Violet Township(OH), Big Walnut Creek(OH), Intermediate Regional Flood.

Magnitude and frequency of flooding along a 2.7 mile reach of Blacklick Creek, a tributary of Big Walnut Creek, are described. With an average slope of 9.6 ft per mile, the stream flows through a well-defined, heavily tree lined channel which averages 88 feet wide. The flood plains are rural and undeveloped, averaging 850 feet in width. Obstructions to flood flows include 4 bridges and natural vegetation. Although flood damages would be limited to crops and road crossings, these could be minimized by application of the flood plain ordinance for which the data herein have been developed. With a streambed elevation of 778.8 feet (mean sea level datum) the Intermediate Regional Flood would be expected to crest at 791 ft msld at Penn Central RR and Refugee Road and 829 msld at Interstate Route 70 where the approximate streambed is 815 msld. Extent of potential flooding is shown on a topographic map. Information is on file with the Army Corps of Engineers to determine flood plain encroachments on a case by case basis for specific locations. (Salzman-North Carolina)
W76-12592

FLOOD PLAIN INFORMATION: FRESHWATER CREEK, HUMBOLDT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Humboldt County, Calif., October 1975. 15 p, 5 fig, 9 plates, 4 tab.

Descriptors: *Flash floods, Floods, *Tidal waters, *Peak discharge, *Flood protection, *Non-structural alternatives, *California, Flood flow, Flood stages, Flow characteristics, Flood plain zoning, Planning.
Identifiers: *Freshwater Creek(CA), Humboldt County(CA), Intermediate Regional Flood, Standard Project Flood.

Freshwater Creek lies in a small coastal mountain basin draining 34 square miles above its confluence with Ryan Slough. Primarily rural with some unincorporated urban development, the flood plains are subject to increasing development, with areas best suited for future urbanization lying along the eastern edge of the City of Eureka, the county seat. In its upper basin the stream slopes at 315 feet per mile, yet averages only 34 ft/mi in the lower basin. Flood season extends from October to April resulting from heavy rains. Floods rise to extreme flood peaks in a short period of time with high velocities in the main stream channels. High tide on Arcata Bay and a flood stage in Freshwater Creek presents an extremely hazardous condition. No flood control works exist; however, implementation of flood plain ordinances and regulations are underway. Because no gaging stations exist, no flood records have been kept except for news reports which indicate that the floods of 1955 and 1965 inundated developed properties. An Intermediate Regional Flood would have an estimated peak discharge of 10,000 cubic feet per second at Freshwater Corners with channel velocities of 4 to 6 ft/sec in the lower reaches, 1 to 3 ft/sec overbank. About 4,000 acres would be flooded by an IRF. A Standard Project Flood would have an estimated peak discharge of 13,800 cfs at Freshwater Corners with slightly higher channel and overbank velocities. (Salzman-North Carolina)
W76-12593

FLOOD PLAIN INFORMATION: YELLOW RIVER, PART III, METROPOLITAN ATLANTA, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for Atlanta Regional Commission, Georgia, June 1973. 32 p, 14 fig, 37 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Storms, Flow characteristics, *Peak discharge, *Georgia, Flood damage, Warning systems, Nonstructural alternatives, Historic floods, Flood data, Flood frequency, Obstructions to flow.
Identifiers: *Yellow River(GA), Pew Creek(GA), Redland Creek(GA), Little Sewanee Creek(GA), *Atlanta(GA), Lawrenceville(GA), Intermediate Regional Flood, Standard Project Flood.

This report presents flood information on a 14.5 mile reach of Yellow River, a 2 mile reach of Pew Creek, a 2 mile reach of Redland Creek and a 3.5 mile reach of Little Sewanee Creek. Located northeast of Atlanta, these streams drain 46.3 square miles above the study area and are characterized by narrow flood plains and slopes ranging from 7 to 45 feet per mile. There are no developments in the narrow flood plain of the Yellow River which are subject to flooding. Existing development in the flood plains is limited to the upper reaches of Redland Creek in the City of Lawrenceville. Expansion of the Atlanta area is expected to bring the flood plains under development pressure in the near future. Vegetation, bridges and culverts in the study area can obstruct floodflows. Flooding can occur in any season and can result from thunderstorms, tropical depressions, and general rainstorms. Five damaging floods have occurred since 1919. Peak discharge during the February 1961 flood reached 9,080 cubic feet per second on the Yellow River as 11.54 inches of rain fell. The Intermediate Regional and Standard Project Floods would have peak discharges of 6,230 and 15,580 cfs, respectively. IRF would flood 1,120 acres and 11 buildings, would rise 15 feet in 24 hours and remain above bankfull 36 hours. Channel velocities during an IRF would be 3-12 ft/sec with overbank velocities 2-3 ft/sec. The SPF would inundate 2,660 acres and 39 buildings and would rise 22 feet in 36 hours and remain above bankfull for 60 hours. In the Atlanta area only Gwinett County has flood plain regulations. (Henly-North Carolina)
W76-12595

SEWER LAYING SYSTEM,
For primary bibliographic entry see Field 8B.
W76-12605

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W76-12627

MIXING AND TRANSPORT, (LITERATURE REVIEW),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-12672

4B. Groundwater Management

GROUNDWATER PROPERTY RIGHTS AND CONTROVERSIES IN MONTANA,
Montana State Univ., Bozeman. Dept. of History, Government and Philosophy.
For primary bibliographic entry see Field 6E.
W76-12154

COMPARATIVE SURVIVAL OF INDICATOR BACTERIA AND ENTERIC PATHOGENS IN WELL WATER,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-12194

CARBON CONTENTS OF SURFACE AND UNDERGROUND WATERS IN SOUTH-CENTRAL MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5A.
W76-12202

DIGITAL MODEL TO PREDICT EFFECTS OF PUMPING FROM THE ARIKAREE AQUIFER IN THE DWYER AREA, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
G. C. Lines.
Water-Resources Investigations 8-76 (open-file report), February 1976. 24 p, 14 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *Groundwater resources, *Projections, *Wyoming, *Computer models, Aquifer characteristics, Potentiometric level, Water levels, Leakage, Pumping, Water utilization, Hydrogeology, Forecasting, Maps, Simulation analysis, Drawdown.
Identifiers: Southeastern Wyoming.

A digital computer model was developed and used to simulate an unconfined sandstone aquifer (Arikaree aquifer) in about 340 square miles in southeastern Wyoming. The model was calibrated by comparing observed and calculated changes in the potentiometric surface and leakage from the aquifer along streams during water year 1974. The comparison was fairly good for changes in the potentiometric surface and was good for leakage. The calibrated model was used to predict changes in the potentiometric surface and leakage through water year 1979, assuming no new ground-water development after 1974 and 6.5 percent of the normal precipitation as recharge to the aquifer. Water-level declines of as much as 14 feet (4.3 meters) were predicted, but much of the area would be relatively unaffected. The total predicted decrease in leakage between water years 1974 and 1979 was about 500 acre-feet per year; the greatest decrease was predicted along streams closest to areas of pumpage. (Woodard-USGS)
W76-12277

THE SHALLOW AQUIFER--A PRIME FRESHWATER RESOURCE IN EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W76-12278

WATER AVAILABILITY OF MONROE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12281

GUIDE TO THE AVAILABILITY OF HYDROLOGIC DATA, GREATER PITTSBURGH REGION, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12282

ESTIMATING GROUNDWATER EVAPOTRANSPIRATION FROM STREAMFLOW RECORDS,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 2D.
W76-12285

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W76-12288

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
F. K. Mack.
Open-file report 76-322, 1976. 31 p, 12 fig, 5 tab.

Descriptors: *Groundwater resources, *Water quality, *Water demand, *Urbanization, *Aquifer characteristics, Data collection, Water yield, Pumping, Water level fluctuations, Hydrogeology, Transmissivity, Projections, Water supply.
Identifiers: *Prince Georges County(Maryland), *Chalk Point(Maryland).

Continued growth of southern Maryland will entail demands for increases in ground-water withdrawals. Part of the process of evaluating ground-water resources in the Chalk Point area is the establishment of the relationship between quantities of water pumped from individual aquifers and the resulting effect on water levels in outlying areas. A test hole was drilled to 1,100 ft at a site several thousand feet north of the high-yielding wells. Utilizing data from the probe hole to determine screen positions, three observation wells were constructed at the site to provide separate wells in the Patapsco, Magothy, and Aquia aquifers. The water level in each of these monitoring wells is affected by barometric pressure and tidal changes in the nearby Patuxent River. The transmissivities of the sand in the Patapsco Formation screened from 832 to 842 ft below sea level; the Magothy aquifer and the Aquia Formation, as determined by water-level recovery tests, are 570 sq ft/day, 730 sq ft/day, and 1,176 sq ft/day, respectively. (Woodard-USGS)
W76-12289

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-12290

A NOTE ON COMPUTING FINITE DIFFERENCE INTERBLOCK TRANSMISSIVITIES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-12292

CHEMICAL CHARACTERISTICS OF THE MAJOR THERMAL SPRINGS OF MONTANA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W76-12293

RECENT ADVANCES IN ARTIFICIAL RECHARGE,
Geological Survey, Austin, Tex.
D. C. Signor.
Paper presented at Proceedings of the Conference of the Great Plains Resources Council, Denver, Colorado, April 8-9, 1976. 17 p, 13 ref.

Descriptors: *Artificial recharge, *Aquifers, *Pit recharge, *Infection wells, *Water spreading, Methodology, Water quality, Sediments, Chemical properties, Water treatment, Anaerobic bacteria, Hydraulic conductivity, Infiltration rates.

This paper is concerned with the techniques of artificial recharge and the problems that confront their utilization. The approaches to solving these problems constitute the recent advances in artificial recharge. Two recharge techniques are commonly used: (1) Spreading basins, in which water that is concentrated on the surface percolates through overlying materials to the formation; and (2) injection wells or shafts, in which there is a direct connection from the surface to the formation. Suspended sediment in the water that is to be recharged by spreading is a serious problem. The sediment settles and is filtered out of the water at the basin surface and restricts subsequent infiltration as the surface becomes sealed by the fine-grained materials. Recent work on this problem has been directed toward developing surface conditions that minimize the sealing effect and toward removing sediment from the input water by chemical treatment. Recharge through injection wells usually requires stringent water-quality considerations, and recharge operations are generally less successful than in spreading basins because suspended sediment in the recharge water clogs the formation near the well. Once the formation is clogged, it is difficult to remove enough sediment to completely rejuvenate the well. The problem can be avoided only if clear water is used for recharge. (Woodard-USGS)
W76-12295

DEVELOPING A STATE WATER PLAN: GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1976,
Geological Survey, Salt Lake City, Utah.
C. T. Sumsion.
Utah Division of Water Resources, Salt Lake City, Cooperative Investigations Report No 15, 1976. 69 p, 40 fig, 2 tab, 15 ref.

Descriptors: *Groundwater resources, *Withdrawal, *Water level fluctuations, *Utah, *Data collections, Hydrologic data, Aquifer characteristics, Water wells, Groundwater basins, Water utilization, Irrigation, Hydrographs, Maps.

This is the thirteenth report in an annual series that describe ground-water conditions in Utah. Reports in the series are prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources, and contain information on well construction, ground-water withdrawals, water-level changes, and related changes in precipitation and streamflow. Supplementary data such as graphs showing chemical quality of water and maps showing water-table configuration are included in reports of this series only for those years or areas for which applicable data are available and are important to a discussion of changing

ground-water conditions. This report includes individual discussions of selected major areas of ground-water withdrawal in the State for the calendar year 1975. Water-level fluctuations, however, are described for the period spring 1975 to spring 1976. The estimated total withdrawal of water from wells in Utah in 1975 was about 800,000 acre-ft, which is about 80,000 acre-ft less than in 1974, but 90,000 acre-ft greater than the average annual withdrawal during 1965-74. Both the decrease from 1974 and the increase over the 10-year average were due primarily to changes in withdrawals for irrigation. (Woodard-USGS)
W76-12296

WATER-LEVEL CHANGES IN SOUTHWESTERN KANSAS, 1940-75,
Geological Survey, Lawrence, Kans.
M. E. Pabst, and E. D. Jenkins.
Kansas Geological Survey Journal, (Lawrence), May 1976. 26 p, 2 fig, 1 plate, 2 tab, 18 ref.

Descriptors: *Groundwater resources, *Irrigation wells, *Water level fluctuations, *Kansas, *Basic data collections, Water utilization, Water yield, Pumping, Withdrawal, Drawdown, Aquifers.
Identifiers: Southwestern Kansas.

The water level in wells in unconsolidated deposits has declined as much as 134 feet since 1940 in parts of southwestern Kansas, primarily as a result of ground-water withdrawals for irrigation. During 1940-74, the number of irrigation wells increased from about 360 to 7,000, and annual withdrawals are estimated to have increased from 60,000 to 2,000,000 acre-feet. Most of the water used in southwestern Kansas is withdrawn from wells screened in unconsolidated deposits of Tertiary and Quaternary age. The unconsolidated deposits comprise the Ogallala Formation of Pliocene age, and undifferentiated deposits and alluvium of Pleistocene age. These deposits form the unconsolidated aquifer. (Woodard-USGS)
W76-12297

GROUND-WATER RESOURCES OF LANE AND SCOTT COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
E. D. Gutentag, and L. E. Stulliken.
Kansas Geological Survey, Lawrence, Irrigation Series no 1, 1976. 37 p, 17 fig, 3 plates, 6 tab, 62 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Irrigation, *Kansas, Water wells, Withdrawal, Water yield, *Water level fluctuations, Groundwater recharge, Transmissivity, Hydrologic data, Maps.
Identifiers: Lane and Scott Counties(Kans).

Lane and Scott Counties, Kansas, comprise an area of 1,444 square miles. Much of the area is underlain by saturated sand and gravel of Pliocene age (Ogallala Formation) and Pleistocene age (undifferentiated deposits) that form a major unconsolidated aquifer. The main body of the aquifer comprises about 34 percent of Lane County and about 81 percent of Scott County. A chalk aquifer, consisting of fractures and solution openings in the Niobrara Chalk of Late Cretaceous age, is being developed for irrigation in southeastern Scott County. A sandstone aquifer, consisting of Upper Jurassic and Lower Cretaceous rocks that underlie both counties, is a potential source of ground water. Yields of wells in the unconsolidated aquifer range from 100 to 1,700 gpm. Yields from 500 to 1,000 gpm are available from wells that tap fractures and solution openings in the chalk aquifer. The sandstone aquifer is tightly cemented in many places and wells in it may not yield sufficient water for irrigation. Results of chemical analyses of water samples from typical wells in the three aquifers indicate that the concentration of dissolved fluoride and dissolved nitrate locally approaches or exceeds the limits recommended by the Kansas Department of Health and Environment for drinking water. (Woodard-USGS)
W76-12298

MAPS SHOWING GROUND-WATER CONDITIONS IN THE HARQUAHALA PLAINS AREA, MARICOPA AND YUMA COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-12299

EFFECT OF CATTLE FEEDLOT WASTES UPON GROUND WATER--A COMMENTARY,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W76-12366

OUTLOOKS FOR THE FUTURE OF DEEP WELL DISPOSAL,
SCS Engineers, Reston, Va.
For primary bibliographic entry see Field 5E.
W76-12370

A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2F.
W76-12432

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN - SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
For primary bibliographic entry see Field 5G.
W76-12444

UNSTEADY FLOW TO A NONPENETRATING ARTESIAN WELL,
Singapore Univ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-12445

THE DEPTH VS. DEPTH PLOT: AN AID TO SELECTING PIEZOMETER INSTALLATION DEPTHS IN BOREHOLES,
Piteau Gadsby Macleod Ltd. North Vancouver (British Columbia).
For primary bibliographic entry see Field 8B.
W76-12447

ANALYTIC SOLUTIONS FOR DETERMINING NATURALLY FRACTURED RESERVOIR PROPERTIES BY WELL TESTING,
Instituto Mexicano del Petroleo, Mexico City.
For primary bibliographic entry see Field 8B.
W76-12449

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W76-12466

WATER SUPPLIES FROM ULSTER VALLEY GRAVELS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
M. Price, and S. S. D. Foster.
The Institution of Civil Engineers, Proceedings, Part 2, Research and Theory, Vol 57, p 451-492, September 1974. 6 fig, 1 tab, 19 ref.

Descriptors: Water resources, *Water supply development, Geologic investigations, *Hydrologic aspects, *Groundwater, Evaluation, Storage, Recharge, Water demand, Industrial water, Economics, Pumping, Rivers, *Gravels.
Identifiers: *Valley gravels, *Ulster(United Kingdom).

Using four examples from Ulster, a discussion is presented of the extent to which techniques of geological exploration and hydrological analysis can be used in the practical evaluation of valley gravels as a water resource. Limitations arise from the geological heterogeneity of these strata and from financial constraints relating to their overall potential, but it is usually possible to make reliable semi-quantitative evaluations of the recharge and storage elements, thus permitting logical water-supply development. Results show that under suitable conditions, valley gravels can be developed to provide low-cost water supplies, particularly where industrial demands of about 10 Ml/day exist. In addition to lower capital and running costs, such schemes have the advantage of utilizing natural storage, albeit limited. (Bell-Cornell)
W76-12524

INTEGRATED MATHEMATICAL MODELS USED FOR GROUNDWATER RESOURCES PLANNING IN AREAS INFLUENCED BY HUMAN SETTLEMENTS,.
Technische Universitaet, Hanover,(West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
G. Battermann, and R. Mull.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., 1974, Volume II. p 29-32. 6 ref.

Descriptors: *Simulation analysis, Computers, *Groundwater resources, *Planning, Mathematical models, Effects, Evaluation, Parametric hydrology, Systems analysis.
Identifiers: Human interference.

The extension of settlements and industrial areas influence groundwater systems, causing both qualitative and quantitative problems. This article reports on investigations made by Battermann in 1973 to integrate most of these problems in a groundwater model. Hanover, Germany was chosen study area. Discussed are: analog, digital, and hybrid simulation methods used in parallel to investigate the groundwater basin affected; parameter evaluation; and the effects of some interferences, such as marshy ground or wet cellars. The cited examples show the problems connected with the evaluation of groundwater budgets in areas affected by human interference. The different computer technqiues allow a good knowledge to be obtained of the parameters influencing the observed systems. A prediction of the behavior of the system in the future under given circustances can be derived from these simulations. (See also W76-12535) (Bell-Cornell)
W76-12543

OPTIMIZATION OF GROUNDWATER WITHDRAWALS WITH REGARD TO TECHNICAL AND HYDROLOGICAL CONSTRAINTS,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
H. Hames, and B. Hoffmann.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., Volume II, p 33-36, 5 ref.

Descriptors: *Groundwater, *Withdrawal, Hydrology, *Optimization, *Constraints, Technology, Water supply, Planning, Hydraulics, Methodlogy, Wells, Pumping, Computers, Equations, Systems analysis.
Identifiers: *Operating plans.

The optimum use and management of available water such as that found in a groundwater reservoir are subject to hydrological and fluid-mechanical restriction; there are also technical constraints caused by size and type of pumping devices. These restrictions and the application of numerical methods require the use of high-speed computers for the prediction of possible water pumpage to aid the engineer in planning. As groundwater will become an increasingly important resource, this paper outlines a methodology for optimizing the use of a groundwater reservoir. The method permits the delivery of operation plans for water-supply devices under the consideration of hydrological and technical--or other--constraints. (See also W76-12535) (Bell-Cornell)
W76-12544

SURFACE WATER AND GROUND WATER INTERACTION PHENOMENA IN PLANNING MODELS,
Geological Survey, Washington, D. C.
T. Maddock, and D. W. Moody.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 112-125. 1 fig, 2 tab, 9 ref.

Descriptors: *Water resources, *Long-term planning, *Surface waters, *Groundwater, *Conjunctive use, Mathematical models, Projects, Equations, Economics, Capital costs, Operating costs, Constraints, Water demand, Hydraulic aspects, Pumping, Aquifers, Wells, Rivers, Optimization, Simulation analysis, Water supply, Evaluation, Systems analysis.
Identifiers: *Mixed-integer programming, Screening, Cost minimization, Interactions.

In planning a water resources system, given a set of feasible water supply projects, a planner might wish to determine which projects could meet future water demands at minimum cost. For screening and sequencing proposed projects, the planner needs an optimization model which explicitly includes surface and ground water interactions in its formulation. This paper describes such a long-range planning model which utilizes mixed-integer programming to minimize the present value of capital and operating costs over a specified planning horizon. A well field may consist of many wells all of which interact with each other and with the stream system. Herein, interactions are expressed in the form of a constraint which limits the amount of water withdrawn from a stream, either directly by diversions and reservoirs or indirectly by ground water pumping, to the quantity of surface water available above that needed to meet downstream flow requirements. The planning model is deterministic. To obtain statistical measures of the performance of a proposed system, subject to variations in streamflow, water demands, etc., the system's operations must be simulated. Discussed is the use of optimization and simulation models and the procedure of aggregation-disaggregation. (See also W76-12535) (Bell-Cornell)
W76-12553

MULTIPURPOSE COMPUTER FOR THE HONOLULU BOARD OF WATER SUPPLY,
Beck (R. W.) and Associates, Seattle, Wash.
S. M. Alexander.
Journal American Water Works Association, Vol. 68, No. 3, p. 147-155. March 1976. 1 fig, 1 plate, 2 ref.

Descriptors: Water resources, *Water management(Applied), *Water supply, *Computer models, *Hawaii, Water, Groundwater, Acquifer management, Networks, Computers.
Identifiers: *Honolulu(HI), *Network analysis.

In order to effectively manage available water resources and operating pumping facilities economically, the Island of Oahu, Hawaii, City and County of Honolulu, has installed an automatic computer control system. The system contains a central processor, core and mass memory to watch over the very complex water supply. Ideally, water is not pumped from acquifer ata rate which exceeds recharge from rain, but at times it has been necessary to surpass this limit. At present the island is divided into 8 primary service areas, but the water board plans to integrate the system and to install booster pumps in some locations to overcome large friction losses in pipes. The control system will supply the requirements of water-system customers within prescribed pressure limits, monitor system operations and alarm detection, manage water resources, utilize available reservoirs to optimum capacity within prescribed constraints, and minimize the cost of pumping. Fixed response control, using a statistical model to predict system requirements, could be used to operate the system, but this must be changed when system parameter change and optimum results will not be obtained. Rather, a dynamic response model has been chosen. This is based on real-time operating analysis of the system through a network analysis model and measuring flows in and out of areas. A great many other accounting and calculating functions are built into the system. Perhaps $20,000 per year will be saved by the system as well as providing improved operation. (Smith - North Carolina)
W76-12589

MIXING AND TRANSPORT, (LITERATURE REVIEW),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-12672

4C. Effects On Water Of Man's Non-Water Activities

HYDROLOGIC IMPACT OF BURNING AND GRAZING ON A CHAINED PINYON-JUNIPER SITE IN SOUTHEASTERN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
G. F. Gifford, J. C. Buckhouse, and F. E. Busby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 476, $4.00 in paper copy, $3.00 in microfiche. Utah Water Research Laboratory, Logan, Publication PRJNR012-1, June 1976. 22 p, 21 f ig, 9 tab, 10 ref. OWRT A-022-UTAH(1). 14-34-0001-6046.

Descriptors: Water quality, *Grazing, Pinyon pine trees, Juniper trees, Nutrients, Soil moisture, Infiltration, Sediments, *Burning, *Utah, Overland flow, Runoff, Coliforms, *Phosphorus, *Potassium, Pollutant identification.
Identifiers: Southeastern Utah, Pinyon-juniper tree type.

Bacterial analysis (fecal and total coliform) of runoff water from infiltrometer plots indicated that the potential public health hazard of livestock grazing on semiarid open range on gentle slopes is probably minimal. Significantly increased amounts of phosphorus and potassium were measured in overland flow following burning on chained-with-debris-left-in-place sites, but no changes were detected in calcium, sodium, or nitrate-nitrogen contents in runoff due to differences in land treatment. One season of grazing was sufficient to depress infiltration rates, though no significant changes were recorded in terms of potential sediment production under either grazing or burning. Soil moisture patterns were not significantly altered during the course of this study as a result of either the grazing or burning treatment.
W76-12153

MAJOR FLOODS, POOR LAND USE DELAY RETURN OF SEDIMENTATION TO NORMAL RATES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-12157

REVEGETATING DEVASTATED SITES IN NEW MEXICO WITH WESTERN WHEATGRASS TRANSPLANTS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
E. F. Aldon, O. D. Knipe, and G. Garcia.
USDA Forest Service Research Note RM-243, June 1973. 3 p, 1 fig, 5 ref/

Descriptors: *Revegetation, *Wheatgrasses, Soil stabilization, *New Mexico, Plant physiology.
Identifiers: Plant transplants.

Western wheatgrass (Agropyron smithii Rydb.) survived well and produced daughter plants from rhizomes during the first year when good seeds were grown to 3-month-old transplants, then transferred to sandy or clay loam sites at elevations of around 7,500 feet. (Forest Service)
W76-12161

WATER YIELD IMPROVEMENT RESEARCH OF THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION AND ITS USEFULNESS TO WILDLAND RESOURCE MANAGEMENT,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith.
In: Proceedings Lake Tahoe Research Seminar IV, Lake Tahoe Reserve Coordinating Board, Lake Tahoe Environmental Education Consortium, South Lake Tahoe, Calif. April 1975, p 3-24, 1975. 1 tab, 30 ref.

Descriptors: *Snow management, *Snowmelt, *Snowpacks, Tracers, Radioisotopes, *Land management, Water management(Applied), *Water yield improvement, *Vegetation effects, *Model studies.

The project mission was to determine the effect of vegetation manipulation upon snow accumulation and melt, so that the changes imposed by vegetation manipulation can be programed to accomplish the desired purpose. An ultimate goal is to develop a model that can be used to estimate such use under any level of plant cover and for any complex of soil, aspect and slope. The results of the study suggest a feasible approach in developing such a model. Water balances are computed by combining calculations for plant water use, soil water movement and energy balance. The current research task is the combining of all snow hydrology data into models of snowmelt with which a land manager, prior to timber harvest, may predict, the effects of alternative land management practices upon time of water delivery to the streams. A second task is the combining of the snow hydrology, plant water use and soil water movement data into models with which the land manager can determine prior to harvest the optimum form of harvest cut for maximizing water yield, aesthetic considerations, change in time of water yield or other management objectives. (Forest Service)
W76-12170

POTENTIAL EFFECTS OF FOREST MANAGEMENT PRACTICES ON STORMFLOW SOURCES AND WATER QUALITY,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 5C.
W76-12173

SEDIMENT YIELDS FROM ROADSIDES: AN APPLICATION OF THE UNIVERSAL SOIL LOSS EQUATION,
Wisconsin Univ., Green Bay. Science and Environmental Change.
G. J. Meyer, P. J. Schoeneberger, and J. H. Huddleston.
Journal of Soil and Water Conservation, Vol. 30, No. 6, p 289-291, November-December 1975. 1 fig, 2 tab, 13 ref. NSF GY-11248.

Descriptors: *Sediment yield, *Roadbanks, *Erosion, *Wisconsin, Pollutants, On-site laboratories, On-site tests, On-site data collections.
Identifiers: *Universal soil loss equation, *Kewaunee River, *School Creek watershed, Nonvegetated.

The rates of erosion were estimated from a number of nonvegetated roadsides by determining roadcut geometry and substituting for parameters in the universal soil loss equation. The average rate of erosion from 104 separate sites was 354 tons of soil per acre per year. The estimate was verified by measuring sediment yield from plot established on selected roadsides. Differences in erodibility between surface soils and subsoils, variations associated with the length of the sampling period, and variations in rainfall patterns accounted for the differences between measured and predicted erosion rates. (Bhowmik - ISWS)
W76-12206

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 5: EFFECTS OF LONG-REACH STREAM CHANNELIZATION ON DISTRIBUTION AND ABUNDANCE OF FISHES,
Iowa Cooperative Fishery Unit, Ames.
B. W. Menzel, and H. L. Fierstine.
Report FWS/OBS-76-15, July 1976. 108 p, 3 fig, 28 tab, 39 ref, 4 append. FWS 14-16-0008-745.

Descriptors: *Channeling, Fish, *Iowa, Rivers, Streams, *Stream morphology, Turbidity, Habitats, Aquatic populations, Populations, Streambed, Fish types, *Distribution patterns, Juvenile fishes, Catfishes, Carp, Rough fish, Shoreline vegetation, Bullheads, Sunfishes, Flow rates, Movement.
Identifiers: *Stream channelization, *Long-reached channelization, Stream types, Sinuosity, Gradient, Bedform, Species diversity, North Raccoon River, Big Cedar Creek, Hardin Creek, Buffalo Creek, North Branch Lizard Creek, Substrates, Stream cover, Woodland streams, Prairier stream.

Fifty-one species of fishes from 11 families were collected. In most samples, cyprinids and catostomids dominated the catch numerically and by weight. The streams supported only limited numbers of game fishes, channel catfish being the most important of these. Catches were highly variable, and there was no strong correlation between gross fish abundance, measured in catch/effort, with either stream sinuosity or gradient. The balance of dominant species shifted according to gradient, however. Young-of-year fishes were most abundant in meandering stream segments, and there was a significant (P = .01) positive correlation between channel sinuosity and catch of juvenile fishes. Most of the species collected were prairie stream types or were wide-ranging in distribution. These fishes exhibited affinities for a sand bottom and tended to be negatively correlated with gradient, variance of velocity and occurrence of a pool-riffle sequence. An Ozarkian ichthyofaunal element was more prominent in the higher gradient, firmer bottomed woodland streams. The species diversity index tended to be depressed at high water levels and in situations of high turbidity, reflecting lower sampling efficiency under such conditions. Species diversity, measured both in terms of numerical abundance and biomass, was generally greatest in unchannelized woodland stream segments. There was little difference in this index between natural and channelized prairie stream stations. Species diversity, therefore, appeared to be primarily a function of stream gradient. Pectoral fin-clipped fishes were recaptured in higher percentages in natural stream segments than in channelized areas. Additionally, there was evidence for greater fish movement between proximate channelized stations than between natural areas. These data suggest that there is greater fish movement throughout straightened reaches. Condition factor and length-weight relationships of channel catfish, carp and river carpsucker showed little difference between collections from channelized and unchannelized areas. This may be attributable to extensive movements of the fishes between the two habitat types. (FWS)
W76-12230

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 4: THE EFFECTS OF LONGREACH CHANNELIZATION ON HABITAT AND INVERTEBRATE IN SOME IOWA STREAMS,
Iowa Cooperative Fishery Unit, Ames.
D. Zimmer, and W. Bachmann.
Report FWS/OBS-76-14, May 1976. 87 p, 7 fig, 8 tab, 24 ref, 2 append. FWS 14-16-0008-745.

Descriptors: *Channeling, Rivers, Streams, *Iowa, *Habitats, Invertebrates, *Channel morphology, Flow rates, Shore-line cover, Streambed, Bedform.
Identifiers: *Long-reach channelization, *Stream channelization, *Invertebrate drift, Gradients, Sinuosity, Habitat diversity, Depth, North Raccoon River, Big Cedar Creek, Hardin creek, Buffalo Creek, North Branch Cedar Creek, Boone River, Cedar Creek, Lizard Creek, Stream cover, Sinuosity, Stream type.

Relationships between channel morphometry, habitat diversity, and invertebrate drift density were studied in 11 natural and channelized stream segments of the upper Des Moines River Basin during 1974 and 1975. Gradients of the study sites ranged from 0.17 to 2.18 m/km; sinousity index values were between 0.95 and 1.67. The most obvious effect of channelization on stream habitat was a reduction in the diversity of water depth and current velocity. There was a significant (P=.05) positive correlation between channel sinuosity and the variability of stream depth and velocity. Invertebrate drift density, expressed as biomass and total counts, was also correlated with channel sinuosity. Sinuous streams had greater concentrations of drifting organisms than did straight channels. There was no relationship between drift density and channel gradient. The impact of channelization on habitat diversity and invertebrate drift density might be minimized if channels were designed with greater sinuosity index values. (FWS)
W76-12231

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT NO. 3 SOME EFFECTS OF SHORT-REACH CHANNELIZATION ON FISH AND FISH FOOD ORGANISMS, IN CENTRAL IOWA WARM WATER STREAM,
Iowa Cooperative Fishery Unit, Ames.
L. R. King, and K. D. Carlander.
Report FWS/OBS-76-13, April 1976. 217 p, 6 fig, 19 tab, 28 ref, append. FWS 14-16-0008-745.

Descriptors: *Channeling, *Fish food organisms, Fish, *Iowa, Streams, Rivers, Channel morphology, Dissolved oxygen, Turbidity, Flow rates, Invertebrates, Benthos, Benthic fauna, Plankton, Aquatic populations, Food habits, Bridge construction, Shore-line cover, Discharge(Water), Sampling, Bullheads, Catfishes, Channel catfishes, Sunfishes, Bass, Carp, Minnows, Rough fish, Fish types, *Bank stabilization.
Identifiers: *Stream channelization, Beaver Creek, Black Hawk Creek, Tipton Creek, Honey Creek, South Fork Iowa River, Short-reached channelization, Stream cover.

Six central Iowa streams were studied in 1974 to determine whether fish and fish food organisms were affected by short-reach channelization associated with bridge replacement in the last 15 years. In all cases the streams had been previously modified in the original bridge construction. The recent construction involved loss of 151 to 429 m of stream length in three streams and in the other streams the new channel was the same length as before. This would involve a loss of up to 18% of the stream if a bridge were built on each section line. Downstream the channel was narrower and shallower and perhaps had less brush shelter than upstream from the channel. Brush shelter was lacking in 2 of the 3 streams channelized in the last 2 years but had recovered somewhat, but not completely, in those channelized 10-15 years earlier. There was no evidence that dissolved oxygen, turbidity, or stream macroinvertebrates as measured by core, drift or artificial substrate samples differed upstream, in the channel, or below. Reduction of brush substrate in the channel and downstream would mean reduction in invertebrate production, however. More fish species were collected by electroshocking in unchannelized than in channelized localities in 5 of the 6 streams and in the 6th the number of species was the same in both localities. In 2 recently channelized streams that lacked cover in the channel, catches of fish were significantly less in the channelized than in the unchannelized localities, but in 3 streams channelized 10 to 15 years where some cover had developed, catches in the channel runs were similar or significantly greater than in unchannelized runs. In the unchannelized locations, however more of the fish were in brush and total populations were not adequately represented by electroshocking in the runs. The most evident impact of short-reach channelization is the removal of cover in the altered area and the loss of stream length. (FWS)
W76-12232

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 2. A STUDY OF THE IMPACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Unit, Ames.
A. L. Witten, and R. V. Bulkley.
Report FWS/OBS-76-12, May 1976. 116 p, 7 fig, 15 tab, 23 ref, 4 append. FWS 14-16-0008-745.

Descriptors: *Bank stabilization, *Retaining walls, *Iowa, *Jetties, Streams, Rivers, *Channel morphology, Water temperature, Turbidity, Invertebrates, Benthos, Fish food organisms, Flow rates, Aquatic populations, Depth, Channel catfish, Catfishes, Bullheads, Sunfishes, Size, Populations, Mayflies, Caddisflies, Structures, Fish.
Identifiers: Skunk River, Soldier River, Wire retard, Permeable jetties, Impermeable jetties, Black bullhead, Green sunfish, *Stream channelization, *Retards, *Fish habitats.

Four types of bank stabilization structures installed mainly for highway protection--revetments, retards, permeable jetties, and impermeable jetties--were studied during the summer and fall of 1974 to determine their impact upon game fish habitat in Iowa streams. Stream width, depth, current velocity, water temperature, and turbidity were measured. Permeable jetties and retards deepened the channel near the structures. Maximum stream depth at or near these structures was from 7 to 110% greater than maximum depth in control sections of the streams. No other signifi-

cant differences in physical parameters between structured and non-structured sections of stream were found. No significant differences (P=0.99) were found in mean body length or abundance of channel catfish (Ictalurus punctatus), black bullhead (Ictalurus melas), and green sunfish (Lepomis cyanellus) between structured and non-structure sections of stream. Unusually high water during the sampling period may have allowed fish to remain dispersed throughout the streams rather than concentrating in the deeper pools at or near some of the stabilization structures, as might be expected in a drier year. Rock revetments and impermeable jetties fostered the growth of some invertebrates (primarily mayflies and caddisflies); these invertebrates were also found in a large percentage of game fish stomachs examined. Revetments, which presented the most rock surface for invertebrate colonization, had the gratest impact on invertebrate abundance A long rock jetty, extending far enough into the stream to produce a scour hole, would combine most of the advantages noted in the structures studied. From the standpoint of habitat improvement, rock seems superior to steel as a construction material, and structures which cause the formation of scour holes superior to those which do not deepen the stream. (FWS)
W76-12233

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARM WATER SPORT FISH IN IOWA: SUBPROJECT I INVENTORY OF MAJOR STREAM ALTERATIONS IN IOWA,
Iowa Cooperative Fishery Unit, Ames.
R. V. Bulkley.
Report FWS/OBS-76-11, July 31, 1976. 338 p, 1 fig, 4 tab, 14 ref, 2 append. FWS 14-16-0006-745.

Descriptors: *Iowa, Streams, *Channeling, Rivers, Census, *Bank stabilization, Aerial photography, Drainage area, Measurement, History, Surveys.
Identifiers: *Sinuousity(Streams), *Stream channelization, Big Sioux River(Iowa).

Aerial photographs and public records were used to determine the amount of channelization of Iowa streams with drainage areas greater than 50 square miles. The extent of channelization was determined by measuring stream sinuosity. It is estimated that from 1000 to 3000 miles of streams have been lost in Iowa since settlers first arrived. (FWS)
W76-12234

WARM WATER STREAM ALTERATION IN IOWA: EXTENT, EFFECTS ON HABITAT, FISH, AND FISH FOOD, AND EVALUATION OF STREAM IMPROVEMENT STRUCTURES (SUMMARY REPORT),
Iowa Cooperative Fishery Unit, Ames.
R. V. Bulkley, R. W. Bachmann, K. D. Carlander, H. L. Fierstine, and L. R. King.
Fish and Wildlife Service, FWS/OBS-76-16, July 1976. 39 p, 3 fig, 11 tab, 33 ref. FWS 14-16-0008-745.

Descriptors: *Channeling, *Iowa, Rivers, Streams, Aquatic populations, Populations, *Fish food organisms, Bridge construction, *Bank stabilization, *Habitats, Depth, Flow rates, Structures, Invertebrates, *Stream improvement, *Channel improvement.
Identifiers: *Stream channelization, Habitat diversity, Sinuosity, Species diversity, Long-reach channelization, Short-reach channelization, Invertebrate drift, Stream cover, Gradient.

Summarized are results given in 5 other subproject reports. Studies were conducted from 1973 to 1976 to determine the extent of stream channelization in Iowa, differences in populations of fish and fish-food organisms in channelized and unchannelized streams, effects of stream alterations for highway bridge construction, and the value of stream-bank stabilization structures to fish habitat. Over 1000 miles of stream capable of supporting permanent fish populations were lost in Iowa through stream channelization. Channelization resulted in more uniform water depth and current velocity in the resulting stream with a reduction in habitat diversity. Sinuous streams had greater concentrations of drift organisms than did straightened channels. More species of fish were found in natural sections, although fish were as abundant in short-reach sections (ca. 0.5 km) channelized 10-15 years ago as in natural sections wherever brush piles and trees had accumulated in the stream. Certain structures installed in Iowa streams to protect highway bridges improved fish habitat by producing scour holes and providing cover and substrate for fish-food organisms. No additional long-reach (1.0 km) channelization should be conducted+ effects of short-reach projects can be lessened by leaving as much meander in the stream as possible and by proper placing and design of bank-stabilization strucutures. (FWS)
W76-12235

SEDIMENT DISCHARGE FROM HIGHWAY CUT-SLOPES IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972-74,
Geological Survey, Menlo Park, Calif.
C. G. Kroll.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 225, $5.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-19, May 1976. 85 p, 14 fig, 13 tab, 18 ref.

Descriptors: *Sediment transport, *Erosion rates, *Road construction, *Lake basins, Streamflow, Drainage systems, Highways, Data collections, Sediment yield, Slopes, *California.
Identifiers: *Lake Tahoe basin(Calif), Highway cut-slopes.

Streamflow and fluvial-sediment discharge data were collected at selected streams and highway gutters in Lake Tahoe basin, Calif., to determine the extent of erosion from highway cuts and to attempt to evaluate the effects of various land-treatment practices to reduce erosion. Estimate of long-term annual total-sediment discharge from six streams into the lake is 7,100 tons, of which 2,300 tons is finer than 62 micrometers. During 1972-74, snowmelt runoff (April-July) accounted for 65 percent of the water and sediment discharge. Approximately 90 percent of the sediment is transported in suspension. Sediment measured at 16 gutterflow stations at the base of highway cut-slopes indicates that less than 100 tons of fine sediment per year are contributed to the lake from all California State highway cuts. Sediment-transport rates are highly variable, and an unknown part of the measured sediment was derived from sources other than highway cuts. Data were not adequate to demonstrate the effectiveness of treatments to stabilize cut-slopes. (Woodard-USGS)
W76-12279

PAVEMENT CRACKING IN WEST TEXAS DUE TO FREEZE-THAW CYCLING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W76-12452

4D. Watershed Protection

MAJOR FLOODS, POOR LAND USE DELAY RETURN OF SEDIMENTATION TO NORMAL RATES,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
Pacific Southwest Forest and Range Experiment Station, USDA Forest Service Research Note PSW-268, 1972. 4 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Watershed management, *Forest management, Streamflow, *Floods, Sediment transport, *Sedimentation, Water quality, Forecasting, *Land use, *California, Monitoring, Lumbering.

Recovery from flood-accelerated sedimentation affects both estimates of long-term average deposition and short-term monitoring of changes. 'Years to return to normal' for 10 watersheds in northern California after a major flood accelerated sediment concentrations were analyzed. Returns to normalcy took from 0 to 9 years; rate of decline was related to both amount of initial acceleration by the flood and differences in watersheds. Years to recovery increased with these four factors: coefficient of path lengths in the watersheds, area of poor logging, area of steep grassland, and percent of area in sedimentary rock types Cenozoic or younger. (Forest Service)
W76-12157

A UNIFORM MEASURE OF SUBAERIAL EROSION,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W76-12191

DERIVATION OF TIME OF CONCENTRATION,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W76-12196

SEDIMENT YIELDS FROM ROADSIDES: AN APPLICATION OF THE UNIVERSAL SOIL LOSS EQUATION,
Wisconsin Univ., Green Bay. Science and Environmental Change.
For primary bibliographic entry see Field 4C.
W76-12206

SEDIMENT DISCHARGE FROM HIGHWAY CUT-SLOPES IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972-74,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W76-12279

MAP OF OVERDIP SLOPES THAT CAN AFFECT LANDSLIDING IN ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-12300

ORGANIC MATTER LOSSES FROM FOUR WATERSHEDS IN THE HUMID TROPICS,
East Carolina Univ., Greenville, N. C. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-12428

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5B.
W76-12435

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W76-12436

PLOT-DERIVED PARAMETERS FOR BASIN COMPUTATIONS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W76-12438

WATER YIELD MODEL USING SCS CURVE NUMBERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 2A.
W76-12522

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

HYDROLOGIC IMPACT OF BURNING AND GRAZING ON A CHAINED PINYON-JUNIPER SITE IN SOUTHEASTERN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 4C.
W76-12153

HYDROGRAPHY AND PHYTOPLANKTON OF THE COAST OF CASTELLON, FROM SEPTEMBER 1969 TO JANUARY 1971, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
J. M. San Feliu, and Y. F. Munoz.
Invest Pesq. 39(1), p 1-36, 1975.

Descriptors: *Phytoplankton, Coasts, *Hydrography, Europe, Data collections, *Water temperature, *Salinity, *Phosphates, *Oxygen, Dissolved solids, Pigments, Primary productivity, Pollutant identification, Secchi disk.
Identifiers: Carbon-14, *Castellon Coast(Spain).

A study was carried out in station B (39 5' n, 00 21' E) F8ESP in the Oceanographic Commission of UNESCO list, 16.8 miles off shore and to 78 m bottom depth. Data taken at several depths: temperature, salinity, density, dissolved inorganic phosphate, O2 and Secchi disc readings are tabulated. Plant pigment and in situ productivity measured by the C14 method are also reported. Currents flow is usually parallel to the coast, but during an annual cycle, from 1-3 observations report flow-moving offshore. Salinity values above 38 0/00 were higher than all previous records, however the concentration of dissolved phosphate was small; only 3 times the concentration of dissolved phosphate over the bottom was above 0.1 micro-gat P/l. The O2 saturation shows figures relatively low at the end of cycle (Nov.). Primary production during the annual cycle (July 1969-June 1970) was as high as in 1962-63 and this is an agreement with the high values of salinity detected during the study. Primary production as measured by the C14 method in situ was estimated by 100 g C/m2 yr. The origin of the water responsible for the fertility of this region may be a local turnover in the Gulf of San Jorge produced by the local wing (cierzo) which blows down the Ebro Valley and is similar to the mistral which induces mixing about 50 miles south of the Gulf of Lions.--Copyright 1975, Biological Abstracts, Inc.
W76-12164

STUDIES ON THE ALGAL COLONIZATION OF THE SAALE RIVER NEAR JENA: PART I. THE TEST AREA AND ITS NON-BIOLOGICAL PROPERTIES, (IN GERMAN),
Jena Univ. (East Germany). Biology Section.
W. Braune.
Limnologica. 9(2), p 203-232, 1974.

Descriptors: *Algae, Rivers, Europe, *Municipal wastes, *Water sampling, Testing, Data collections, Physicochemical properties.
Identifiers: *Algal colonization, Jena, *Saale River(E Germany).

The physiography, hydrography, geology and humand population density of the area (in East Germany) are described and daily water flow and global radiation measurements from 1963-1968 are analyzed. Monthly tests were conducted with water samples from 2 points in which water temperature, actual O2 content, 48 h O2 consumption, NH4, NO2, NO3, orthophosphate, Cl, Ca and Mg levels, carbonate hardness, pH values and KMnO4 consumption were determined. Annual variations in these values and the effect of city waste on these factors were correlated.--Copyright 1975, Biological Abstracts, Inc.
W76-12166

APPARATUS FOR CONDITIONING UNLIMITED QUANTITIES OF FINISHED WATERS FOR ENTERIC VIRUS DETECTION,
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
W. F. Hill, Jr., E. W. Akin, W. W. Benton, C. J. Mayhew, and W. Jakubowski.
Appl Microbiol. 27(6), p 1177-1178, 1974.

Descriptors: Euteric bacteria, *Viruses, Microorganisms, *Pollutant identification, Apparatus, Instrumentation.
Identifiers: *Enteric virus, *Finished waters.

An apparatus was developed, constructed and tested for conditioning unlimited quantities of finished waters for enteric virus detection.--Copyright 1974, Biological Abstracts, Inc.
W76-12168

ENVIRONMENTAL FACTORS INFLUENCING ISOLATION OF ENTEROVIRUSES FROM POLLUTED SURFACE WATERS,
New Hampshire Univ., Durham. Dept. of Microbiology.
T. G. Metcalf, C. Wallis, and J. L. Melnick.
Appl Microbiol. 27(5), p 920-926, 1974.

Descriptors: *Isolation, *Viruses, *Enteric bacteria, Pollutant identification, *Texas, Treatment facilities, Bays, Environmental effects, Waste water treatment.
Identifiers: Enteroviruses, *Galveston Bay(Tex), Picornaviruses, Houston area(Tex).

The influence of water quality upon the concentration of virus on location was assessed in field studies conducted in the Houston ship channel, Galveston Bay, and Houston waste treatment plants in Texas. Clarification of polluted surface waters was accomplished with minimal loss of virus. Virus from clarified sewage effluents and saline waters was then adsorbed and concentrated on textile and membrane filter surfaces. Direct measurements of virus from large volumes of polluted surface waters under existing field conditions were then made using the virus concentrator equipment.--Copyright 1974, Biological Abstracts, Inc.
W76-12171

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Research Lab.
For primary bibliographic entry see Field 5B.
W76-12172

EVALUATING THE MEMBRANE FECAL COLIFORM TEST BY USING ESCHERICHIA COLI AS THE INDICATOR ORGANISM,
Missouri Univ., Rolla. Life Science Lab.
J. B. Hufham.
Appl Microbiol. 27(4), p 771-776, 1974.

Descriptors: *Coliforms, E. coli, Evaluation, Filtration, *Bioindicators, *Membranes, *Filters, *Pollutant identification, Testing procedures.
Identifiers: *Enterobacter-Aerogenes, *Membrane filter method.

The fecal coliform membrane filter method (MFC) currently used in water pollution analysis was evaluated using 2 strains of E. coli, a known fecal coliform, as the indicator organism. A large relative error in the results obtained with this method was dependent upon the brand of membrane filter employed, the medium, and the temperature of incubation. MFC densities varied between 10 and 60% of the densities determined by total bacteria counts and total coliform counts performed at 35 degrees C. Due to the large relative error encountered, the MFC method cannot be recommended as an analytical tool for the laboratory enumeration of E. coli. The MFC method can be used at 35 degrees C for enumeration of E. coli and for differential counts of E. coli and Enterobacter aerogenes.--Copyright 1974, Biological Abstracts, Inc.
W76-12175

MERCURY IN WADERS FROM THE WASH,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
J. L. F. Parslow.
Environ Pollut. 5(4), p 295-304, 1973.

Descriptors: *Mercury, Europe, *Pollutant identification, *Wading birds, Seasonal, Water pollution effects, Industrial wastes, Heavy metals.
Identifiers: Calidris-Alpina, Calidris-Canutus, Liver, Tringa-Totanus, Wash(England).

Concentrations of total Hg were determined in the livers of 73 waders (Limicolae) collected during Aug.-March on the Wash, eastern England, in order to obtain baseline data on levels of this element in birds living in a non-industrial and presumably lightly polluted estuarine area. In the knot (Calidris canutus), Hg levels were relatively low, about 1 ppm dry weight, in early autumn but increased through the winter until, by Feb.-March, they were about 10-20 times higher. On more limited or scattered data, the dunlin (C. alpina) and redshank (Tringa totanus) also showed much higher Hg levels in late winter compared with autumn. Hg accumulated in the liver during the winter months (When the birds are exclusively estuarine, mainly in temperature latitudes) is probably eliminated in summer (on mainly inland arctic and subarctic breeding grounds). The results are discussed in relation to the molt, movements and food of the main species. The biological significance of the concentrations found in the Wash waders is uncertain, but it is suggested that in industrial estuaries Hg levels in the same species may be very much higher and, by analogy with other species, could be having detrimental physiological effects.--Copyright 1974, Biological Abstracts, Inc.
W76-12176

THE CHEMISTRY OF 700 YEARS OF PRECIPITATION AT DYE 3, GREENLAND,
Army Cold Regions Research and Engineering Lab., Hanover, N. H.
J. H. Cragin, M. M. Herron, and C. C. Langway, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A014 970, $3.50 in paper copy, $3.00 in microfiche. Research Report 341, July 1975. 22 p, 5 fig, 9 tab, 30 ref, 1 append. NSF AG-212, AG-394.

Descriptors: *Precipitation(Atmospheric), *Snow, *Aerosols, *Chemical analysis, *Air pollution, Dusts, Fallout, Lead, Chemistry, Path of pollutants, Instrumentation, Analytical techniques, Ice, Sulfates, Sodium, Deposition(Sediments), Pollutants.

Identifiers: *Ice cores, *Dye-3(Greenland), *Surface snow, *Snow chemistry, Atmospheric transport, Ice sheets, Pollutant lead aerosols, Sea salt, Terrestrial dust, Pollutant sulfur aerosols, Greenland snow deposits.

Concentrations of sodium, potassium, magnesium, calcium, silicon, aluminum, lead and sulfate were measured in surface snow and in individual annual accumulation layers from a 373-m-deep ice core from Dye 3, Greenland, covering the time period from 1232 to 1971 A.D. Average background (pre-1840) concentrations in micrograms/liter are: Na, 12.9 + or - 9.3; K,2.2 + or - 2.1; Mg, 1.5 + or - 1.0; Ca, 4.8 + or - 2.4; Si, 12 + or - 6; Al, 3.3 + or - 1.4; Pb, 0.07 + or - 0.06; and S04, 56 + or - 22. Deviations are due mainly to the variability of the concentrations in the samples deposited over the stated time interval rather than analytical precision. Observed concentrations of sodium, potassium, magnesium, calcium, silicon and aluminum can be adequately explained by relative abundances of these elements in seawater and terrestrial dust. Late 19th century annual ice layers contain twice as much sulfate as pre-1840 deposits, reflecting the increased use of fossil fuels in the Northern Hemisphere. Lead concentrations in post-1955 snow deposits are more than an order of magnitude greater than pre-1840 baseline concentrations and are attributed to smelting and the increased use of lead alkyls in gasoline. (Henley - ISWS)
W76-12181

COMPARATIVE SURVIVAL OF INDICATOR BACTERIA AND ENTERIC PATHOGENS IN WELL WATER,
Montana State Univ., Bozeman. Dept. of Microbiology.
G. McFeters, G. K. Bissonnette, J. J. Jezeski, C. A. Thomson, and D. G. Stuart.
Appl Microbiol. 27(5); p 823-829, 1974.

Descriptors: *Bioindicators, Water wells, Bacteria, *Pathogenic bacteria, Coliforms, *Enteric bacteria, Water supply, Membranes, Pollutant identification, Water pollution, Salmonella, Streptococeus, Shigella.
Identifiers: Aeromonas-Sp, Flexneri, Vibrio-Cholerae.

The comparative survival of various fecal indicator bacteria and enteric pathogens was studied in a stable well water supply by using membrane chambers. There was more variation in the 29 coliform cultures and they died more rapidly, as a group, than the 20 enterococcus cultures that were examined. The comparative survival of the organisms tested follows: Aeromonas sp.> the shigellae (Shigella flexneri, S. sonnei, and S. dysenteriae) >fecal streptococci>coliforms = some salmonellae (Salmonella enteritidis serotype paratyphi A and D, S. enteritidis serotype typhimurium)>Streptococcus equinus>Vibrio cholerae>Salmonella typhi>Streptococcus bovis> Salmonella enteritidis serotype paratyphi B. S. bovis had a more rapid die-off than did S. equinus, but both had significantly shorter half-live than the other streptococci. The natural populations of indicator bacteria from human and elk fecal material declined similarly to the pure cultures tested, whereas the die-off of fecal streptococci exceeded the coliforms from bovine fecal material.--Copyright 1974, Biological Abstracts, Inc.
W76-12194

CARBON CONTENTS OF SURFACE AND UNDERGROUND WATERS IN SOUTH-CENTRAL MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. J. Maier, R. G. Gast, C. T. Anderson, and W. W. Nelson.
Journal of Environmental Quality, Vol. 5, No. 2, p 124-128, April-June 1976. 1 fig, 6 tab, 23 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Carbon, *Water quality, *Minnesota, *Biochemical oxygen demand, Analytical techniques, Organic matter, Water pollution, Surface runoff, Surface drainage, Water supply, Underground streams, Groundwater, Tile drains, Waste treatment, Tile drainage, Seasonal, Tiles.
Identifiers: Cottonwood River(Minn), Redwood River(Minn), *Total organic carbon, Carbon contents, South-central Minesota, *Organic carbon, *Inorganic carbon, Underground waters, Seasonal storage, Water quality characteristics, Carbon analysis, Beckman carbon analyzer, Drain tiles.

Data presented showed that the relatively ample supplies of water available from dependable stream flow in the upper Mississippi region will have to be supplemented on a seasonal basis by utilizing either surface or underground water storage. Such seasonal storage would affect the existing interflows of water between surface, subsurface, and groundwaters. It could also affect the temporal variations in chemical content of both surface runoff and storage waters. Analysis of the inorganic and organic C contents of surface, subsurface, and groundwater in the glaciated area of south-central Minnesota was conducted to determine the extent that seasonal interchange of surface and groundwaters may effect water quality. Organic C concentrations were 5-17, 1-6, and less than or equal to 2 mg/liter in surface, subsurface, and groundwaters, respectively, indicating that most organic materials are decomposed or retained in the upper layers of the soil with minimal transfer to groundwaters. The relatively high organic C concentration in surface waters was probably due to biodegradation of vegetation and animal tissues in stream channels or in top soil layers, marshes, and impoundments. Low organic C concentrations and relatively low flow volumes from tile drains indicated that their effect on organic C content of rivers in this area was minimal. (Henley - ISWS)
W76-12202

LEAD NITRATE POISONING IN THE CARP (CYPRINUS CARPIO L.):LOCALIZATION OF THE POLLUTANT IN THE BODY, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
M.-P. Gire, J. -F. Narbonne, and A. Serfaty.
Eur J Toxicol Environ Hyg. 7(2), p 98-103, 1974.

Descriptors: *Nitrates, *Lead, *Carp, *Spectrophotometry, *Pollutant identification, Poisons, Toxicity, Water pollution effects.
Identifiers: *Atomic absorption spectrophotometry, Lead nitrate.

The Pb content in various organs and tissues of the carp, a freshwater fish, was estimated during long-term experimental poisoning with lead nitrate. Samples were taken every wk for 6 wk. Pb was determined by atomic asorption spectrophotometry. Pb content varied considerably from tissue to tissue. The organs and tissues examined can be classified in this order of increasing Pb content: skeletal muscle, gonads, brain, heart, blood, liver and pancreas, bone, gills and abdominal kidneys.--Copyright 1975, Biological Abstracts, Inc.
W76-12251

PRINCIPLE OF A TECHNICAL DEVICE FOR THE STUDY OF TOXIC EFFLUENTS IN WATER POLLUTION, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
R. Labat, G. Dazarola, and A. Chatelet.
Bull Soc Hist Nat Toulouse. 109(1/2), p 163-170, 1973.

Descriptors: *Pollutant identification, *Toxicity, *Lethal limit, *Fish, *Respiration, Carp, Effluents, Water pollution effects, Perches, Instrumentation, Measurement.
Identifiers: Perca-Fluviatilis, Tinca-Tinca, *Cardiac monitoring.

To quantify lethal concentrations of toxic materials, the lethal concentration for 50% of the test fishes was determined. The cardiac and respiratory frequencies of test fishes were studied while they were relatively free to swim in their medium. The species used were: Cyprinus carpio, Tinca tinca and Perca fluviatalis, armed with electrodes to follow the ECG and a little balloon to study respiration. These 2 parameters were regularly visualized and electronically registered, then analyzed. --Copyright 1975, Biological Abstracts, Inc.
W76-12255

AUTOMATIC DETERMINATION OF SULFATES BY AN IMPROVED NEPHELOMETRIC METHOD: APPLICATION TO THE DETERMINATION OF SO2 IN ATMOSPHERIC AIR AND OF SULFATES IN RAIN WATER, (IN FRENCH),
Institut d'Hygiene et d'Epidemiologie, Brussels (Belgium).
G. Verduyn, and A. Derouane.
Atmos Environ. 8(7), p 707-715, 1974.

Descriptors: *Pollutant identification, *Sulfates, *Rain water, Atmosphere, *Air pollution, Analytical techniques, Sulfur compounds, Automation, Oxides, Fluorometry.
Identifiers: *Nephelometric method, Sulfur dioxide(Air).

An automatic nephelometric method for the determination of low concentrations of sulfate is described. It permits the determination of concentrations as low as 0.1 micro-g cm-3. The sulfate ions are precipitated by barium perchlorate. Fifty samples can be analyzed per h. This method was developed for the determination of sulfur dioxide in air after absorption in diluted hydrogen peroxide. It is applicable to the determination of sulfate amounts in rain water. The equipment used is the Technicon Auto Analyzer connected with a 2 monochromators spectrofluorimeter.--Copyright 1975, Biological Abstracts, Inc.
W76-12259

TRACE METALS AND POLLUTION OF THE BELGIAN COAST AND OF THE SCHELT ESTUARY, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
E. Peeters, J. Das, M. Mertens, and M. A. Castiaux.
Bull Inst R Sci Nat Belg Biol. 49(13), p 1-13, 1973.

Descriptors: *Trace elements, *Metals, *Pollutant identification, *Spectrophotometry, Estuaries, Coasts, Nitrates, Nutrients, Phosphates, Neutron activation analysis, Copper, Chromium, Iron, Lead, Zinc, Nickel.
Identifiers: Belgian coast, Gadus-merlangus, Pleuronectes-platessa, Trachurus-trachurus, *Atomic absorption spectrophotometry, North Sea, Shelf estuary(Belgium).

Atomic absorption spectrophotometric assay of various metals (Cr, Cu, Fe, Zn, Pb and Ni) was done on water of the North Sea and the Schelt estuary. For some metals a comparison is made between atomic absorption assay values and neutron activation measurements. Cu and Zn were assayed in the organs of 3 common species of fish in the North Sea (Pleuronectes platessa, Gadus merlangus and Trachurus trachurus). These results are compared with nutrient salt concentrations (nitrates, nitrites and phosphates) in the same waters. Zn and Cu values were in the normal range, but high values were observed for trace metals, such as Cr, Ce, Co and Hg.--Copyright 1975, Biological Abstracts, Inc.

W76-12260

DETERMINATION OF BORON IN DRINKING WATER FROM KOSZALIN PROVINCE, (IN POLISH),
Medical Academy, Poznan (Poland). Inst. of Chemistry and Analytics.
J. Grochmalicka, and E. Ponitka.
Poznan Tow Przyj Nauk Wydz Lek Pr Kom Farm. 10, p 59-64, 1973.

Descriptors: *Pollutant identification, Potable water, *Boron, Colorimetry, Sea water intrusion, Water analysis, Water pollution sources, Groundwater.
Identifiers: Colorimetric carmine method, Koszalin Province(USSR).

Determinations of the B content in drinking water were performed in the province of Koszalin (USSR) by a colorimetric carmine method. The values obtained were from 0.012-0.035 mg b/l; the larger content in waters nearer the sea, the lower content farther inland. The B content in sea water was 0.637 mg b/l. The higher content of B in waters near the sea is possibly caused by penetration of sea water into the ground water.--Copyright 1975, Biological Abstracts, Inc.
W76-12261

ISOLATION OF PARASITIC AND SAPROPHYTIC STRAINS OF BDELLOVIBRIO BACTERIOVORUS FROM NATURAL WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
T. V. Doskina.
Gig Sanit. 38(12), p 84-85, 1973.

Descriptors: *Isolation, *Parasites, E coli, *Bacteria, *Viruses, *Pollutant identification.
Identifiers: *Bdellovibrio-bacteriovorus, Lysis, Saprophytic parasites.

Strains of B. bacteriovorus isolated by the method of plaque-forming units (using a lawn of growing Escherichia coli cells) are considered parasitic and those isolated by the method of spontaneous lysis (suspension of heat-killed E. coli) are saprophytic. The transformation of parasitic strains to saprophytic and vice versa is possible depending on whether B. bacteriovorus is cultured with live or dead host cells.--Copyright 1975, Biological Abstracts, Inc.
W76-12262

FUNDAMENTAL STUDIES ON RESIDUE AND MOVEMENT OF FORESTRY HERBICIDES IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
For primary bibliographic entry see Field 5B.
W76-12263

ON THE METHODS OF DETERMINING THE SULFATE CONTENT OF WATER, AND THE DESCRIPTION OF A NEW PHOTOMETRIC METHOD, (IN HUNGARIAN),
Wasser-Kanalis. Komitats Hajdu-Bihar, Debrecen (Hungary).
I. Devai, K. Horvath, and G. Devai.
Acta Biol Debrecina. 10/11, p 129-142, 1972.

Descriptors: *Pollutant identification, *Sulfates, Water analysis, *Photometry, Analytical techniques, Methodology, Ions.

A review of previously proposed methods is given. In the proposed test, the sulfate ions in the test sample are precipitated with a certain amount of barium chloride. The residual quantity of barium, after the addition of potassium chloride, is then photometrically determined. If the amount of sulfate ions is determined in the dilutions of a standard solution whose sulfate content is already known, acurve, based on the extinction values, may be plotted and used to determine the sulfate content of test samples. Using this method, the upper limit is 200 mg/l if the test sample remains undiluted.--Copyright 1975, Biological Abstracts, Inc.
W76-12270

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12280

WATER AVAILABILITY OF MONROE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12281

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-12284

GROUND-WATER RESOURCES IN THE LOMPOC AREA SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W76-12288

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W76-12289

GEOLOGY AND WATER RESOURCES OF BROWN COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W76-12290

CHEMICAL CHARACTERISTICS OF THE MAJOR THERMAL SPRINGS OF MONTANA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W76-12293

GROUND-WATER RESOURCES OF LANE AND SCOTT COUNTIES, WESTERN KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12298

WINTER HYDROCHEMICAL CONDITIONS OF SMALL RIVERS IN THE POLESYE OF THE UKRAINIAN SSR (THE PRIPYAT BASIN), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-12303

USE OF INFRARED SPECTROSCOPY FOR DETERMINING ENVIRONMENTAL POLLUTANTS, (IN RUSSIAN),
All-Union Labour Protection Research Inst. of the Central Council of Trade Unions, Leningrad (USSR).
V. A. Simonov, E. V. Nekhorosheva, and N. A. Zavorovskaya.
Gig Sanit. 10, p 71-72, 1974.

Descriptors: Infrared radiation, *Pollutant identification, *Spectroscopy, *Organic compounds, *Organic wastes, Oil wastes, *Chemical wastes, Industrial wastes, *Acids.
Identifiers: Carbon tetrachloride, Carboxylic acid, Exhaust gases, Lindane, Toluene diisocyanate, Aldehydes.

A brief review is presented of the literature on the use of IR spectroscopy in industrial-sanitary chemistry for analyzing noxious substances in air and wastewaters, such as carboxylic acids, aldehydes, alpha-methylstyrene, lindane, dibutyl phthalate, toluene diisocyanate, CCl_4, dichloroethan, exhaust gases, dispersed oil in wastewaters, etc.--Copyright 1975, Biological Abstracts, Inc.
W76-12307

HYDROGRAPHY AND PHYTOPLANKTON FROM THE BAY OF CADIZ, FROM JANUARY OF 1970 TO DECEMBER OF 1973, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Laboratorio de Investigaciones Pesqueras.
R. Establier.
Invest Pesq. 39(1), p 225-248, 1975.

Descriptors: *Phytoplankton, *Biomass, Bays, *Hydrography, Europe, Water temperature, Salinity, Seston, *Spectrophometry, *Pollutant identification.
Identifiers: Plant pigments, *Bay of Cadiz(Spain).

Information was gathered regularly at 4 stations (Spain). Temperature, salinity, plant pigments and computed biomass are plotted. The results of spectrophotometric analysis of filtered seston are summarized.--Copyright 1975, Biological Abstracts, Inc.
W76-12309

FIRST DATA ON THE EXPERIMENTAL STUDY OF THE ZINC CYCLE IN THE LAGOON OF L'OLIVIER, (IN FRENCH),
Centre National de La Recherche Scientifique, Marseille (France). General Biology and Ecology Lab.
J. P. Baudin.
Vie Milieu Ser B Oceanogr. 24(1), p 59-80, 1974.

Descriptors: *Radioecology, *Zinc, Lagoons, Radioisotopes, *Tracers, Cladophora, Europe, Water temperature, Algae, Sediments, Pollutant identification.
Identifiers: Physa-Acuta, Sphaeroma-Hookeri, *Lagoon of L'Olivier(France).

Radioecological data were obtained from 3 groups of experiments with Zn 65 used as a tracer. The transfer of the Zn 65 from the water into the sediment was recorded for various temperatures in 3 stations of the lagoon. The fixation and the elimination of Zn 65 by algae of the genus Cladophora were studied. The transfer of the radioelement from this alga to the gastropod Physa acuta and to an isopod Sphaeroma hookeri Leach are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-12310

SANITARY AND HYGIENIC EVALUATION OF THE WATER OF THE UZHGOROD WATER SUPPLY SYSTEM, (IN RUSSIAN),
M. Y. Blyumberg, N. F. Grishchenko, and V. A. Sabov.
Gig Sanit. 4, p 102-103, 1974.

Descriptors: Rivers, *Public health, *Water supply, *Potable water, *Municipal water, Al-

kalinity, Chlorine, Oxidation, Ammonia, Nitrates, Nitrites, Chlorides, Sulfates, Hydrogen ion concentration, Water level, Rainfall, Water chemistry.
Identifiers: *Uzh River(USSR), Uzhgorod(USSR), Ukrainian-SSR.

The relation between the physicochemical and the hydrologic characteristics of the Uzh River, which supplies the city of Uzhgorod (Ukrainian SSR, USSR) with water, was studied. Transparency, alkalinity, residual Cl, oxidizability, ammonia, nitrates, nitrites, chlorides, sulfates and pH were analyzed. There was a close relation between the amount of rainfall, the water level in the river and the chemical composition of tap water.--Copyright 1975, Biological Abstracts, Inc.
W76-12313

HYGIENIC EVALUATION OF CERTAIN SURFACE-ACTIVE SUBSTANCES, COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii i Mikrobiologii, Lvov (USSR).
E. A. Kordysh, and M. M. Ratpan.
Gig Sanit. 10, p 16-20, 1974.

Descriptors: *Pollutant identification, Effluents, Bioassay, Toxicity, Lethal limit, *Textiles, *Industrial wastes, Water pollution effects, Rodents, Public health.
Identifiers: *Stearoxa-6, *OC-20.

Sanitary-toxicologic features of 4 components of effluents stearoxa-6 and OC-20 compound (nonionogenic surface-active substances), alkamon OC-2 and A smoothing compound (cationactive complexes) are presented. In the discharge of these compounds into the natural waters their limiting property is the formation of foam. The standard permissible concentrations in surface waters of OC-20 compound, A smoothing compound, alkamon OC-2 and of stearoxa-6 comprise 0.1, 0.3; 0.5 and 1 mg/l, respectively. Guinea pigs, mice and rats were used for bioassays.--Copyright 1975, Biological Abstracts, Inc.
W76-12314

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF HYDROGEN PEROXIDE IN SURFACE WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
V. I. Antonova, Z. A. Salmina, L. L. Latkina, A. P. Bukina, and N. I. Mishina.
Gig Sanit. 10, p 20-22, 1974.

Descriptors: Public health, *Lethal limit, Potable water, *Organoleptic properties, *Toxicity, *Municipal water, Rodents, Rabbits, Water supply, Pollutant identification.
Identifiers: Hydrogen peroxide.

The effect produced by H2O2 on the organoleptic properties of water, the sanitary state of surface waters and on warm-blooded animals under conditions of acute, subacute and chronic action were studied. The data make it possible to substantiate and recommend the maximum permissible concentration of H2O2 at a level of 0.1 mg/l for water bodies intended for municipal use. The limiting index of noxiousness is the sanitary toxicologic one. Rats and rabbits were studied.--Copyright 1975, Biological Abstracts, Inc.
W76-12315

SANITARY-CHEMICAL INVESTIGATION OF THE MIGRATION OF THE MONOMER FROM CAPROLON INTO WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5B.
W76-12316

A NEW STANDARD 'DRINKING WATER' (GOST 2874-73) AND ITS SCIENTIFIC BASIS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5G.
W76-12317

THE USE OF DIATOMS AND BACTERIA AS BIOLOGICAL INDICATORS OF POLLUTION IN STREAMS, (IN PORTUGESE),
Museu Rio-Grandense Ciencias Nat., Porto Alegre. (Brazil).
C. C. Medaglia, L. W. Aguiar, and M. Corte-Real.
Iheringia Ser Bot. 19, p 11-24, 1974.

Descriptors: *Diatoms, *Bacteria, *Bioindicators, Water pollution, South America, Streams, Pollutant identification.
Identifiers: *Brazil.

The results of studies using diatoms and bacteria as biological indicators of water pollution are presented. The brook studied was Arroio Diluvio (Porto Alegre-Southern Brazil), selected because of its oligosaprobic, mesosaprobic and polysaprobic conditions. International saprobic systems were used and a new system comparing occurrence of both diatoms and bacteria in the same area is proposed.--Copyright 1975, Biological Abstracts, Inc.
W76-12318

THE MERCURY CONCENTRATION IN EELS (ANGUILLA ANGUILLA) FROM THE ESTUARY OF THE GUADALQUIVIR RIVER AND 'ESTEROS' OF SALINES OF CADIZ BAY, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Dadiz (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5C.
W76-12321

PRELIMINARY STUDIES OF ASBESTIFORM FIBERS IN DOMESTIC WATER SUPPLIES,
California Univ., Berkeley.
R. C. Cooper, and J. C. Murchio.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-011 855, $3.50 in paper copy, $3.00 in microfiche. Report AMRL-TR-74-125, Paper No. 5, December, 1974. p. 61-73. 3 fig., 7 ref.

Descriptors: Water quality, Laboratory tests, *Analytical techniques, *Water quality control, Water pollution sources, Water sources, *Water analysis, Water purification, *Asbestos, Mine wastes, Surface waters, Water supply, *Domestic water, *Pollutant identification, *Electron microscopy.
Identifiers: *Asbestiform fibers, Asbestos fiber analysis.

Nineteen water samples were collected in California, five from Houston, Texas, one from Wisconsin, and nine from Duluth, Minnesota, and were examined for their asbestiform fiber content. Analysis was by electron microscope. One can predict the occurrence of these matrials by understanding the geology of the watersheds and the industrial operations that are in process. Analysis of results from northern California water supplies indicate that water supplies exposed to large outcroppings of serpentine rock can contain considerable amounts of chrysoltile asbestos fibers. (Katz)
W76-12325

RELEASE OF THE CARCINOGEN BENZO(A) PYRENE FROM ENVIRONMENTALLY CONTAMINATED MUSSELS,
British Columbia Univ., Vancouver. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W76-12328

ACUTE EFECTS OF CADMIUM ON ICTALURUS PUNCTATUS (CATFISH),
Texas A and M Univ., College Station. Dept. of Veterinary Physiology and Pharmacology.
For primary bibliographic entry see Field 5C.
W76-12331

AN ACUTE SEPTICAEMIC DISEASE OF BROWN TROUT (SALMO TRUTTA) AND ATLANTIC SALMON (SALMO SALAR) CAUSED BY A PASTEURELLA-LIKE ORGANISM,
Norges Veterinarhoegskole, Oslo.
For primary bibliographic entry see Field 5C.
W76-12332

ACUTE TOXICITY OF PHOS-CHECK (TRADE NAME) 202 AND DIAMMONIUM PHOSPHATE TO FATHEAD MINNOWS,
Environmental Health Lab., Kelley AFB, Tex.
For primary bibliographic entry see Field 5C.
W76-12334

A REVIEW OF LITERATURE ON THE USE OF POTASSIUM PERMANGANATE (KMN04) IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
For primary bibliographic entry see Field 5C.
W76-12335

EFFECT OF CATTLE FEEDLOT WASTES UPON GROUND WATER--A COMMENTARY,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W76-12366

SAMPLING AND CALCULATION METHODS FOR DETERMINING QUANTITIES OF NITROGEN AND PHOSPHORUS IN WATERSHED RUNOFF,
Agricultural Research Service, Columbia, Mo.
R. E. Burwell, G. E. Schuman, R. F. Piest, W. E. Larson, and E. E. Alberts.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. 2 fig, 5 tab, 10 ref.

Descriptors: *Nitrogen, *Phosphorus, *Agricultural runoff, Sediments, Watersheds(Basins), *Sampling, *Path of pollutants, *Iowa, *Pollutant identification, Water pollution sources.

The nitrogen and phosphorus content of surface runoff from two watersheds in southwestern Iowa was analyzed for a 5-year period (1969-1973). Sampling and calculation procedures were evaluated for quantifying discharges of water-soluble NO3-N, NH4-N, and inorganic P and sediment-associated Kjeldahl N and NaHCO3-extractable P. The arithmetic mean nutrient concentration of samples collected during major runoff (greater than 10 cfs), multiplied by the quantity of water or sediment discharged, compared favorably with a standard integration procedure for determining N and P discharge associated with surface runoff. (Skogerboe-Colorado State)
W76-12372

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS (164.6) STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, Md.
C. M. Schwing, W. T. Engel, J. H. Highby, and D. M. Wagner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 918,

$6.00 in paper copy, $3.00 in microfiche. Environmental Protection Agency, Report No. EPA-430/1-75-007, May 1975. 107 p, 7 append. 900501.

Descriptors: *Monitoring, *Effluents, *Pollutant identification, *Water pollution control, Water quality control, Laboratory tests, Laboratory equipment, Microbiology, Training, Education, *Training.
Identifiers: Outer Continental Shelf, Reference manuals.

Basic Laboratory Skills is a course designed for the treatment plant operator or technician who is required to monitor effluent discharges under a National Pollutant Discharge Eliminating System (NPDES) permit and who had little or no previous experience in laboratory work. The manual to be used by the student contains a review of basic mathematics which includes the metric system, whole numbers, decimals, formulas and percentage. The chemical laboratory sections contains applications such as weighing techniques, use of laboratory equipment, and preparation and standardization of reagents. An introduction to basic microbiological techniques is also included. (Sinha-OEIS)
W76-12377

EVALUATION OF SOLID WASTE BALING AND BALEFILLS. VOLUME I,
Ralph Stone and Co., Inc., Los Angeles, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 185, $7.75 in paper copy, $3.00 in microfiche. Environmental Protection Agency, Final Report, 1975. 213 p, 64 fig, 49 tab. 68-03-0332.

Descriptors: *Solid wastes, *Monitoring, *Cost analysis, *Landfills, Pollution abatement, Municipal wastes, *Minnesota.
Identifiers: Baling, Balefills, St. Paul(Minn).

The results of a one-year evaluation of a solid waste high-density baling plant, transportation and associated sanitary landfill operations of the American Hoist and Derrick Company in St. Paul, Minnesota is reported. The work program consisted of four stages: (1) a five-day intensive monitoring program of the baling plant and bale transportation operations; (2) cost analysis during two years of plant operation; (3) a 12-month period of monitoring a bale test cell constructed at the St. Paul bale landfill; and (4) a nine-month period of monitoring the bale sanitary landfill operation. Test cell monitoring included analyzing leachate and gas samples, recording and analyzing temperature trends, and settlement/expansion. Landfill monitoring included time and motion studies, fly emergence studies, and odor, litter, dust, and vectors evaluation. Comparisons were made between the bale landfill and normal environmental conditions. The feasibility of solid waste baling plants was evaluated, and compared to milling and combined solid waste baling and milling systems. (Sinha-OEIS)
W76-12381

FIRST STUDIES ON THE ZOOPLANKTON OF THE LOTIC WATERS OF THE MIDDLE PARANA RIVER BASIN, (IN SPANISH),
For primary bibliographic entry see Field 5C.
W76-12382

DISSOLVED OXYGEN PROBE,
Fischer and Porter Co., Warminster, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12391

TECHNIQUE FOR CONTINULUSLY ANALYZING THE CONCENTRATION OF OZONE DISSOLVED IN WATER,
Fischer and Porter Co., Warminster, Pa. (Assignee).
For primary bibliographic entry see Field 5F.
W76-12405

REMOTE SENSING OF MARINE HYDROCARBON SEEPS,
Barringer Research Ltd., Rexdale (Ontario). (Assignee).
A. R. Barringer.
U. S. Patent No. 3,961,187, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 435, June 1, 1976.

Descriptors: *Patents, Water pollution sources, *Remote sensing, *Seepage, Oceans, Resources development, Bioluminescence, Optical properties, Oil industry, Exploration, *Oil pollution, Nutrients, *Organic compounds, *Pollutant identification.

A method and apparatus is provided for detecting the presence of dissolved hydrocarbon gases in the ocean remotely from an aircraft or a boat. It has been discovered that frequently gas seeps are accompanied by increased optical scattering in the water and also by an increased concentration of microorganisms growing in the water. The most common gas to seep from the sea floor is methane which provides an excellent nutrient for certain types of bacteria existing in the sea. These bacteria multiply rapidly and in turn provide an increased supply of nutrients for secondary growths of organisms that cannot be supported by methane along. An intense beam of light such as that generated by a laser is pointed downward from an over-flying aircraft. This beam of light preferably is pulsed, although a continuous source of light could be used with somewhat lesser effectivity. The wavelength of light chosen is in the blue or ultraviolet in order to achieve maximum sensitivity to scattering in the water and to stimulate bioluminescence in suspended microorganisms. The signal returned from the sea can be measured through a narrow band filter at the same wavelength as that of the emitting source to monitor turbidity and scattering. The bioluminescence emission can also be measured at a longer wavelength. An important feature is that surface and sub-surface reflections can be separated, because the surface reflections may be attributable to hydrocarbon slicks due to pollution, plankton, etc. instead of hydrocarbon seeps. (Sinha-OEIS)
W76-12411

ANALYTICAL THREE-DIMENSIONAL TRANSIENT MODELING OF EFFLUENT DISCHARGES,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 5B.
W76-12433

CHEMICAL AND MICROBIOLOGICAL DEGRADATION OF MALATHION AND PARATHION IN AN ESTUARINE ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, Miss. Microbiology Section.
For primary bibliographic entry see Field 5B.
W76-12437

OXYGEN ISOTOPE STUDIES ON SEA ICE IN THE GULF OF ST. LAWRENCE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2C.
W76-12448

AN HISTORICAL PERSPECTIVE OF NUTRIENT INPUTS AND TROPHIC STATES AS DEDUCED FROM CAYUGA LAKE SEDIMENTS,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W76-12463

MULTIVARIATE ANALYSIS OF GEORGIA COASTAL PLAIN GROUNDWATERS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 2F.
W76-12466

COLOR CHARACTERIZATION OF KRAFT LINERBOARD DECKER EFFLUENT,
Institute of Paper Chemistry, Appleton, Wis.
H. S. Dugal, M. A. Buchanan, E. E. Dickey, and J. Swanson.
Paperi ja Puu, Vol. 58, No. 4a, Special issue, p 211-214, 217-218, 221-222, 225, April, 1976. 8 fig, 11 ref, 7 tab.

Descriptors: *Pulp wastes, *Color, Wastes, Industrial wastes, Water pollution sources, Lignins, Carbohydrates, Water quality, *Chromatography, Softwood, Hardwood, Effluents, *Pollutant identification.
Identifiers: *Deckers(Pulp thickeners), Kraft mills, Board mills, Indulin(Alkali lignin).

Decker effluents from a kraft linerboard mill using 98% softwoods and 2% hardwoods (Interstate Paper Corporation, Riceboro, Georgia) were investigated. Concentrated solutions of freeze-dried solids from the colored effluets were acidified to give acid-insoluble and acid-soluble components which were further fractionated by gel permeation chromatography. Most of the color bodies were of ligninlike character and seemed to comprise lignin degraded to various degrees. The acid-insoluble color bodies contained a high proportion of carboxylic and/or ketonic carbonyl groups conjugated with aromatic rings, whereas the acid-soluble color bodies contained a nonconjugated COOH group and appeared to be associated with carbohydrate material. All isolated color bodies were negatively charged and showed mobilities higher than Indulin (alkali lignin), indicating a higher density of negative charge per molecule. (Brown-IPC)
W76-12472

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5D.
W76-12475

AN IMPROVED IN SITU PH SENSOR FOR OCEANOGRAPHIC AND LIMNOLOGICAL APPLICATIONS,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W76-12479

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5B.
W76-12480

DETERMINATION OF ALUMINUM IN PAPER MACHINE WHITE WATER BY POTENTIOMETRIC TITRATION WITH FLUORIDE ION,
Melbourne Univ., Parkville (Australia).
A. Homola, and R. O. James.
Analytical Chemistry, Vol. 48, No. 4, p 776-778, April, 1976. 2 fig, 16 ref, 3 tab.

Descriptors: *Aluminum, *Pulp wastes, *Water analysis, Water pollution sources, Calcium, Fluorides, Ions, Analytical techniques, *Volumetric analysis, *Pollutant identification.
Identifiers: *White water(Paper machines), *Potentiometric titration.

Aluminum in paper machine white water may be determined with less than 2% relative standard deviation by potentiometric fluoride titration, provided calcium (which may be a source of interference) is below 200 mg/liter. (Witt-IPC)
W76-12482

ANALYSIS OF HIGH-PURITY WATER AND ACIDS BY SPARK SOURCE MASS SPECTROMETRY,
National Research Council of Canada, Ottawa (Ontario).
A. Mykytiuk, D. S. Russell, and V. Boyko.
Analytical Chemistry, Vol. 48, No. 11, p 1462-1464, September, 1976. 1 fig, 5 ref, 3 tab.

Descriptors: *Water analysis, *Inorganic compounds, *Acids, *Mass spectrometry, Analytical techniques, Sulfur, Chlorine, Bromine, Boron, Laboratory equipment, Trace elements, Water pollution sources, Water chemistry, Water properties, Spectroscopy, Plastics, Pollutant identification.
Identifiers: Hydrochloric acid, Hydrofluoric acid, Nitric acid, Teflon, Vycor, Poly-4-methylpentene-1.

A convenient method for determining the trace inorganic impurities in high-purity water, hydrochloric, hydrofluoric, and nitric acids is described. The samples are concentrated in a Class 100 environment and the resulting residues are examined in a spark source mass spectrograph. Approximately 25 elements are usually detected above the concentration of 0.005 nanogram/gram (0.005 parts per billion). The technique permits the determination of sulfur, chlorine, bromine, and boron in water. Polypropylene and poly-4-methylpentene-1 beakers introduced less contamination than did those of linear polyethylene, Teflon, and Vycor. (Witt-IPC)
W76-12483

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF 3-TRIFLUOROMETHYL-4-NITROPHENOL IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. A. Coburn, and A. S. Y. Chau.
Journal Association of Official Analytical Chemists, Vol. 59, No. 4, p 862-865, July, 1976. 1 fig, 9 ref, 2 tab.

Descriptors: *Pesticides residues, *Water analysis, *Gas chromatography, Water pollution sources, Trace elements, Lampreys, Natural streams, Water chemistry, *Phenols, Great Lakes, Analytical techniques, Chromatography, Ion exchange, *Pollutant identification.
Identifiers: 3-Trifluoromethyl-4-nitrophenol, *Lampricides.

3-Trifluoromethyl-4-nitrophenol (TFM) is used for the control of sea lamprey in the Great Lakes. A procedure for the analysis of this compound in natural waters is described. The lampricide is extracted from acidified water samples on the macroreticular resin XAD-7 and eluted from the column with ethyl ether. The ether extract is dried, concentrated, and partitioned with potassium carbonate. TFM is acetylated in the aqueous alkaline solution and the acetate derivative is extracted into benzene for analysis by electron capture gas-liquid chromatrography. Recoveries of TFM from natural waters exceeded 90%, and as little as 0.01 microgram TFM can be detected in a 1 liter sample. (Witt-IPC)
W76-12486

BUBBLE TUBE: APPARATUS FOR DETERMINING RATE OF COLLECTION OF BACTERIA BY AIR BUBBLE RISING IN WATER,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
D. C. Blanchard, and L. D. Syzdek.
Limnol Oceanogr. 19(1), p 133-138, 1974.

Descriptors: *Bacteria, *Pollutant identification, Bubbles, Air, Apparatus, Data collections, Analytical techniques.
Identifiers: Serratia-Marescens, *Air bubbles, Bubble tube.

An air bubble rising through a bulk suspension of bacteria can be made to rise into a tube containing sterile water, which can then be cultured to determine the number of bacteria carried by the bubble. If the distance of bubble rise is varied, data are obtained from which both the attachment rate of bacteria to the bubble and the collection efficiency can be calculated. For a bubble of about 1-mm diameter rising through a suspension of Serratia marcescens, the collection efficiency is about 0.1%.--Copyright 1974, Biological Abstracts, Inc.
W76-12492

DETERMINATION OF CHLORINE DIOXIDE AND OTHER ACTIVE CHLORINE COMPOUNDS IN AQUEOUS SOLUTIONS (OZNACZANIE DWUTLENKU CHLORU ORAZ INNYCH AKTYWNYCH ZWIAZKOW CHLORU WROZTWORACH WODNYCH),
K. Ascik, and M. Glinska.
Przeglad Papierniczy, Vol. 32, No. 4, p 145-147, April, 1976. 1 fig, 8 ref.

Descriptors: *Water analysis, Water chemistry, Trace elements, Chlorine, Sodium arsenite, Hydrogen ion concentration, Water pollution sources, Electrodes, *Analytical techniques, *Pollutant identification, Volumetric analysis.
Identifiers: *Chlorine compounds, *Amperometric titration, *Chloramine, *Chlorine dioxide, *Chlorites, Hypochlorites.

The method described, intended primarily for the analysis of water containing low concentrations of chlorine compounds, makes it possible to determine active chlorine, chloramine, chlorine dioxide, and chlorite by 4 consecutive amperometric titrations with sodium arsenite solution. Active chlorine (free chlorine + hypochlorite + hypochloric acid) is titrated after chlorine dioxide has been eliminated by hydrolysis at pH 11, and the sample neutralized to pH 7. Titration under the same conditions but in the presence of KI gives the amount of free chlorine + chloramine. Titration at pH 7 without preliminary alkaline hydrolysis and in the presence of KI gives free chlorine + chloramine + 20% chlorine dioxide. And finally, free chlorine + chloramine + chlorine dioxide + chlorite are determined in a sample acidified to pH 2 and then neutralized to pH 7. The principles of the consecutive titrations are discussed, and a description is given of the analytical procedure and the apparatus used (a silver electrode immersed in a solution of NaCl in a glass tube, and a platinum electrode in the form of a wire wound about lower porous part of the tube). The method is rapid (about 20 min) and accurate. The error is less than 0.01 ppm. (Stapinski-IPC)
W76-12510

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-12521

ON THE POLLUTION OF WATER OF SOME RIVERS IN THE KASUMIGAURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W76-12568

THE CHROMATOGRAPHIC METHOD OF DETERMINING INORGANIC AND ORGANIC MERCURY COMPOUNDS IN FRESH WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
M. A. Klisenko, and A. M. Shmigidina.
Gig Sanit. 1, p 64-65, 1974.

Descriptors: *Mercury, *Chromatography, *Pollutant identification, Organic compounds, Inorganic compounds, Water analysis, Analytical techniques.
Identifiers: *Mercury compounds.

A chromatographic method for determining inorganic and organic Hg compounds in fresh water is discussed. The determination is based on isolating the Hg compounds in a low acid acetate buffer in the presence of composite III and potassium sulfocyanate, elimination of excess hitizone and chloroform and chromatography of the sample on a thin layer of silicate.--Copyright 1975, Biological Abstracts, Inc.
W76-12569

MICROBIOLOGICAL CHARACTERIZATION OF THE LACUSTRINE DEPOSIT LAID OPEN BY DRYING UP OF THE GREACA LAKE, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2J.
W76-12571

GROWTH AND DISSIPATION OF PHYTOPLANKTON IN CHESAPEAKE BAY: I. RESPONSE TO A LARGE PULSE OF RAINFALL,
Johns Hopkins Univ., Baltimore, ,Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 5C.
W76-12572

SEVERAL WATER CHEMISTRY DATA ON THE KNOWLEDGE OF THE SECTION OF THE DANUBE BETWEEN BUDAPEST AND TURNU SEVERIN (1645-930 KM) (DANUBIALIA HUNGARICA LXVII), (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
E. V. Kozma.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol. 15, p 53-58, 1973.

Descriptors: *Water chemistry, Europe, Alkalinity, Hydrogen ion concentration, *Ions, Hardness(Water), *Pollutant identification, Rivers, *Path of pollutants, Water analysis.
Identifiers: Budapest, *Danube River, Danubialia, Hungarica, Hungary, Kilometer, Romania, Severin, Turnu.

The pH, alkalinity, carbonate hardness, noncarbonate hardness, hydrogen carbonate ion, total hardness, C ions, Mg ions, SiO2, chloride ions, ammonium, nitrite, nitrite ions and O2 consumption were measured at 24 locations above and below the mouth of the Save ,(in Hungary and Romania), a tributary of the Danube, from July 19-24, 1971. The findings are compared with those obtained along the Save. Below the mouth of the Save, the ammonium ion content decreased to 1/3, the nitrite ion content practically doubled and the average values for nitrite ions and SiO2 rose slightly. The amount of chloride ion, in contrast with the Ca, Mg and hydrogen carbonate ions, also increased in a downstream direction.--Copyright 1975, Biological Abstracts, Inc.
W76-12574

THE LINKAGE BETWEEN CHEMICAL POLLUTION AND BACTERIOLOGICAL POLLUTION IN COASTAL ZONES. (RECHERCHE D'UNE LIAISON ENTRE LA POLLUTION CHIMIQUE ET LA POLLUTION BACTERIOLOGIQUE DANS LES ZONES LITTORALES),
Commissariat a l'Energie Atomique, Pierrelatte (France).
For primary bibliographic entry see Field 5B.
W76-12590

SOME OBSERVATIONS REGARDING PENTACHLOROPHENOL LEVELS IN HAVERFORD TOWNSHIP, PENNSYLVANIA,
Villanova Univ., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-12591

NITROGEN AVAILABILITY IN URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W76-12596

AN INEXPENSIVE SAMPLER FOR STUDYING THE MICROBIOLOGY OF RIVER MUD,
Reading Univ. (England). Dept. of Microbiology.
R. M. Webster.
Limnol Oceanogr. 19(1), p 159-161, 1974.

Descriptors: Microbiology, *Mud, *Sampling, Rivers, *Pollutant identification, Bacteria, Fungi.
Identifiers: *River mud, *ATP determination.

A sampler with a plastic internal lining was used to obtain undisturbed cores of mud for ATP determinations and total counts of bacteria and fungi; another application of the internal lining was the successful recovery of nylon mesh buried in the mud.--Copyright 1974, Biological Abstracts, Inc.
W76-12599

A COUNTERSTAINING TECHNIQUE FOR USE IN SORTING BENTHIC SAMPLES,
Waterloo Univ., (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W76-12606

TYPES OF MICRO-ORGANISMS IN ACTIVATED SLUDGE IN DEPENDENCE OF TEMPERATURE AND NITRIFICATION (DIE BESIEDLUNG DES BELEBTEN SCHLAMMES IN ABHAENGIGKEIT VON TEMPERATUR UND NITRIFIKATION),
H. J. Frenzel.
Zeitschrift fuer Wasser- und Abwasser-Forschung, Vol. 9, No. 3, p 71-75, 1976. 10 fig, 12 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Microscopy, *Protozoa, Temperature, *Nitrification, *Pilot plants, *Pollutant identification.
Identifiers: Rotatoria, Epistylis plicatilis, Arcella vulgaris, Lecane sp.

Sludge from four activated sludge pilot plants was microscopically examined over a period of several years to test statistically the dependence on nitrification and temperature of 10 protozoa and rotatoria species. Epistylis plicatilis, Arcella vulgaris, and Lecane species strongly depend on nitrification and temperature in all types of treatment plants. Other tested species showed no dependence on nitrification and temperature. (Snyder-FIRL)
W76-12615

WASTEWATER TREATMENT - PHYSICAL AND CHEMICAL METHODS, (LITERATURE REVIEW),
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-12629

PERSISTENCE OF VIRUS ON SEWAGE-IRRIGATED VEGETABLES,
Ohio Bureau of Foods, Cincinnati. Virology Branch.
For primary bibliographic entry see Field 5B.
W76-12634

SEPTIC TANK EFFICIENCY,
ADI Ltd., Fredericton (New Brunswick).
For primary bibliographic entry see Field 5D.
W76-12640

WATER-POLLUTION INSTRUMENTATION,
Weston (Roy F.), Inc., West Chester, Pa.
R. G. Thompson.
Chemical Engineering, Vol. 83, No. 13, p 151-154, June 21, 1976. 3 fig, 1 tab, 5 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Instrumentation, Equipment, *Monitoring, Measurement, Dissolved oxygen, Carbon, Organic compounds, Biochemical oxygen demand, Turbidity, Sampling, Chlorine, Chlorination, Aeration, Incineration, Dewatering, Filters, Digestion tanks, Temperature, Conductivity, Neutralization, *Pollutant identification.

Brief descriptions of water pollution control instrumentation and monitoring techniques are presented. Waste water treatment equipment discussed includes: neutralization sections, primary clarifiers, aeration basins, thickeners, digesters, dewatering devices, incinerators, filters, and chlorination systems. Monitoring techniques covered include: flow monitoring, pH monitoring, temperature monitoring, turbidity measurements, conductivity measurements, residual chlorine monitoring, dissolved oxygen monitoring, total organic carbon monitoring, and biochemical oxygen demand measurements. Composite sampling is also discussed. (Kreager-FIRL)
W76-12653

CONCENTRATIONS OF NITRIFYING BACTERIA IN SEWAGES, EFFLUENTS, AND A RECEIVING STREAM AND RESISTANCE OF THESE ORGANISMS TO CHLORINATION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5D.
W76-12654

BULKING CONTROL MADE EASY - WITH HYDROGEN PEROXIDE,
FMC Corp., Princeton, N.J.
For primary bibliographic entry see Field 5D.
W76-12664

5B. Sources Of Pollution

FURTHER THERMAL ADDITION STUDIES AT CRYSTAL RIVER, FLORIDA WITH AN ANNOTATED CHECKLIST OF MARINE FISHES COLLECTED 1969-1971,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-12163

STUDIES ON THE ALGAL COLONIZATION OF THE SAALE RIVER NEAR JENA: PART I. THE TEST AREA AND ITS NON-BIOLOGICAL PROPERTIES, (IN GERMAN),
Jena Univ. (East Germany). Biology Section.
For primary bibliographic entry see Field 5A.
W76-12166

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Research Lab.
J. D. Schreiber, P. D. Duffy, and D. C. McClurkin.
Journal of Environmental Quality, Vol 5, No. 2, p 201-205, 2 fig, 6 tab, 21 ref.

Descriptors: *Nutrients, Water quality, Chemistry of precipitation, Baseline studies, *Nitrogen, *Phosphorus, *Cations, Cycling nutrients, *Storm runoff, Pine trees, *Mississippi, Forest watersheds, Coastal plains, Watersheds(Basins), Water analysis, Water chemistry, Pollutant identification, Path of pollutants.
Identifiers: *Nutrient net gain or loss, Nutrient flux, Coastal Plain watersheds.

Storm runoff from five reforested eroded watesheds in northern Mississippi (1.5 to 2.8 ha) was analyzed during the 1973 water year to determine the concentrations of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K. Storm runoff was measured with 0.91-m H-flumes and samples were collected with a Coshocton wheel sampler. Analysis of precipitation which totaled 189 cm for the year, 40% above average, revealed that inputs of NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 3.12, 5.73, 0.07, 7.72, 3.03, and 4.98 kg/ha, respectively. Soluble nutrient losses in the storm runoff on a unit area basis were similar for the five watersheds. Average losses in storm runoff of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 0.32, 3.35, 0.04, 6.21, 3.05, and 3.31 kg/ha, respectively. As the annual storm runoff among the watersheds increased, the NO3-N losses also increased linearly. Data for individual storms indicated that a critical storm runoff value must be exceeded before the watersheds would exhibit a net loss of each nutrient. (Forest Service)
W76-12172

THE CHEMISTRY OF 700 YEARS OF PRECIPITATION AT DYE 3, GREENLAND,
Army Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 5A.
W76-12181

COMPARATIVE SURVIVAL OF INDICATOR BACTERIA AND ENTERIC PATHOGENS IN WELL WATER,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-12194

SEDIMENT YIELDS FROM ROADSIDES: AN APPLICATION OF THE UNIVERSAL SOIL LOSS EQUATION,
Wisconsin Univ., Green Bay. Science and Environmental Change.
For primary bibliographic entry see Field 4C.
W76-12206

THE TROPHIC STATE OF NORTH CAROLINA LAKES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-12210

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES

OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12214

DEGRADATION OF DDT IN AN EVERGLADES MUCK AS AFFECTED BY LIME, FERROUS IRON AND ANAEROBIOSIS,
Agricultural Research Service, Baton Rouge, La.
J. F. Parr, and S. Smith.
Soil Sci. 118(1), p 45-52, 1974.

Descriptors: *DDT, *DDD, *Lime, *Iron, Respiration, Bacteria, Aerobic condition, Anaerobic conditions, *Degradation(Decomposition).
Identifiers: *Anaerobiosis, *Everglades muck.

DDT degraded slowly (less than < 5% recovered as DDD) in an Everglades muck amended with alfalfa meal and incubated for 4 wk under moist aerobic, moist anaerobic, and flooded anaerobic (unstirred) conditions. Degradation was more extensive in a flooded anaerobic environment subjected to continuous stirring where about 14% of the DDT was recovered as DDD. Liming the muck from pH 5.3 to 6.8 caused a greated conversion of DDT to DDD in the moist anaerobic environment than did the application of ferrous Fe, while the opposite was true for the flooded anaerobic environment. DDT degradation was greatest where muck was amended with alfalfa meal, lime and Fe2+ and followed the order of flooded anaerobic (stirred)>flooded anaerobic (unstirred)>moist anaerobic. Recovery of DDD from these environments was approximately 56, 32 and 10%, respectively. Lime caused a marked increase in bacterial populations in the anaerobic environments and was correlated with greater respiratory activity and increased DDT degradation. The application of Fe2+ particularly to flooded anaerobic muck samples appeared to substantiate a chemical mechanism for conversion of DDT to DDD. The extent of DDT degradation increased as the redox potential (Eh) decreased. --Copyright 1974, Biological Abstracts, Inc.
W76-12254

TRACE METALS AND POLLUTION OF THE BELGIAN COAST AND OF THE SCHELT ESTUARY, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
For primary bibliographic entry see Field 5A.
W76-12260

DETERMINATION OF BORON IN DRINKING WATER FROM KOSZALIN PROVINCE, (IN POLISH),
Medical Academy, Poznan (Poland). Inst. of Chemistry and Analytics.
For primary bibliographic entry see Field 5A.
W76-12261

FUNDAMENTAL STUDIES ON RESIDUE AND MOVEMENT OF FORESTRY HERBICIDES IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
M. Konnai, Y. Takeuchi, and T. Takematsu.
Bull Coll Agric Utsunomiya Univ. 9(1), p 95-112, 1974.

Descriptors: *Path of pollutants, *Pesticide residues, *Herbicides, Soils, *Adsorption, Inorganic compounds, Pollutant identification, Decomposing organic matter, Humus.

The movement and adsorption of these herbicides are dependent on the physical and chemical properties of the compounds. The movement was greater with inorganic compounds whose basic structures are charged negatively (ClO3-, NH2SO3-). The degree of translocation in the soil was varied due to such factors as soil character, humus, rainfall, intensity of rainfall and inclination of land. Resulting from these experiments, chlorate, sulfamin and fatty acid type herbides showed bigger movement and small with phenoxy, benzoic type herbicides. Esterized compounds revealed extremely little movement; they were firmly adsorbed on the soil surface. The herbicides of high water solubility with negative charge were highly correlated with the movement of soil water. With regard to the residue (decomposition and inactivation) determination, 6 compounds tested were inactivated completely 4-14 wk when applied at standard dosage. The inactivation tends to be rapid with DPA (2,2-dichloro propionic acid) and slow with TFP (2,2,3,3-tetrafluoro propionic acid) and AMS (ammonium sulfamate). As the dosages increase, the term of residue was relatively prolonged especially with TFP, TBA (2,3,6-trichloro benzoic acid) and 2, 4, 5-T. Factors responsible for decomposition and inactivation were organic matters, soil water, humidity and light.--Copyright 1975, Biological Abstracts, Inc.
W76-12263

SUCCESSION OF PLANKTON DIATOMS IN TOKYO BAY, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W76-12268

QUANTITY OF HETEROTROPHIC BACTERIA ON SOME HIGHER PLANTS IN CARP PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
A. F. Antipchuk.
Gidrobiol Zh. 10(1), p 63-64, 1974.

Descriptors: *Bacteria, *Carp, Fish hatcheries, Distribution, Path of pollutants, Vegetation, Microorganisms, Detritus, Ponds.
Identifiers: *Heterotrophic bacteria.

A determination of the abundance and distribution of heterotrophic saprophytic bacteria on the most common plants in carp ponds established high concentrations of bacteria in the zone of higher aquatic vegetation, which probably can be regarded as a result of the utilization of the intravital excretions of plants and detritus accumulating in the vegetation zone by the microorganisms. This assumption was confirmed by the fact that there were more microorganisms on the plant leaves than on the stems.--Copyright 1975, Biological Abstracts, Inc.
W76-12271

A STOCHASTIC MODEL FOR PREDICTING THE PROBABILITY DISTRIBUTION OF THE DISSOLVED-OXYGEN DEFICIT IN STREAMS,
Geological Survey, Reston, Va.
I. I. Esen, and R. E. Rathbun.
Available from Supt. of Documents, GPO, Washington, D. C. 20402, $1.55. Professional Paper 913, 1976. 50 p, 24 fig, 13 tab, 23 ref.

Descriptors: *Model studies, *Biochemical oxygen demand, *Streams, *Waste water(Pollution), *Stochastic processes, Monte Carlo method, *Dissolved oxygen, Oxygen sag, Reaeration, Self-purification, Waste assimilative capacity, Water pollution, Water quality control, Forecasting.

A random walk model was developed for predicting the distribution of the biochemical-oxygen-demand for points downstream from a waste source for a stream system in which the deoxygenation coefficient is a normally distributed random variable. A Monte Carlo technique for simulating a random walk process was used for estimating the distribution of the dissolved-oxygen deficit at downstream points in a stream in which both the deoxygenation and reseration coefficients are normally distributed random variables. Equations for approximating the mean oxygen deficit and the variance of the oxygen deficit were developed by expanding the basic equation of the stochastic model in a Taylor series. The frequency distributions of the oxygen deficit predicted by the stochastic model became flatter and skewed to the right as time of travel increased. The critical time of travel estimated from the stochastic model was larger than the critical time of travel computed from the deterministic model. The variance of the oxygen deficit at the critical time of travel was largest for small ratios of the reaeration and deoxygenation coefficients and smallest for the large ratios. (Woodard-USGS)
W76-12276

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W76-12283

DISTRIBUTION OF TRACE ELEMENTS IN BOTTOM SEDIMENTS OF THE KIEV RESERVOIR UKRAINIA SSR, USSR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
E. P. Nakhshina.
Gidrobiol Zh. 10(6), p 13-17, 1974.

Descriptors: *Distribution, *Trace elements, *Reservoirs, Sediments, *Bottom sediments, Zinc, Copper, Cobalt, Manganese, Water storage, Statistical methods, Path of pollutants.
Identifiers: Ukrainian-SSR, Kiev reservoir(USSR).

The peculiarities of Mn, Zn, Cu and Co distribution in soils of the pelagic and littoral zones of the Kiev water storage basin (Ukrainian SSR, USSR) and factors determining this distribution were studied. The observed regularities were substantiated by statistical processing of the results.--Copyright 1975, Biological Abstracts, Inc.
W76-12305

DISTRIBUTION OF HETEROTROPHIC BACTERIA IN WATER AND BOTTOM DEPOSITS OF THE KREMENCHUG RESERVOIR IN RELATION TO THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN RUSSIAN),
Kiev State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W76-12306

SANITARY-CHEMICAL INVESTIGATION OF THE MIGRATION OF THE MONOMER FROM CAPROLON INTO WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. O. Sheftel', and R. E. Sova.
Gig Sanit. 6, p 93-94, 1974.

Descriptors: Public health, *Plastics, Water temperature, Potable water, Chemical analysis, Hydrogen ion concentration, *Polymers, *Pollutant identification, *Path of pollutants.
Identifiers: *Caprolactam, *Caprolon, *Migration(Monomers).

The rate of migration of the monomer caprolactam was mathematically determined, in order to study the possibility of using caprolon articles in contact with drinking water. Migration was affected considerably by the water temperature and its contact time with the plastic. A change in pH of the water within limits permissible for drinking water does not affect migration of the monomer.--Copyright 1975, Biological Abstracts, Inc.

W76-12316

THE USE OF DIATOMS AND BACTERIA AS BIOLOGICAL INDICATORS OF POLLUTION IN STREAMS, (IN PORTUGESE),
Museu Rio-Grandense Ciencias Nat., Porto Alegre. (Brazil).
For primary bibliographic entry see Field 5A.
W76-12318

PRELIMINARY STUDIES OF ASBESTIFORM FIBERS IN DOMESTIC WATER SUPPLIES,
California Univ., Berkeley.
For primary bibliographic entry see Field 5A.
W76-12325

RELEASE OF THE CARCINOGEN BENZO(A) PYRENE FROM ENVIRONMENTALLY CONTAMINATED MUSSELS,
British Columbia Univ., Vancouver. Dept. of Zoology.
B. P. Dunn, and H. F. Stich.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 4, p 398-401, 1976. 1 fig, 7 ref.

Descriptors: *Absorption, *Bioindicators, *Mussels, *Organic compounds, *Mollusks, Laboratory tests, Water quality control, *Pollutant identification, Invertebrates, Analytical techniques, Water quality.
Identifiers: *Benzo(a)pyrene release.

The occurrence of benzo(a)pyrene (B(a)P) in mussels has been found to be a good indicator for the contamination of bodies of water with polycyclic aromatic hydrocarbons. It is important to know the residence-time of the compound in the species under investigation. Mussels were collected from a contaminated location and transferred to clean water and release of B(a)P was determined. The amount of B(a)P, initially 45 micrograms/kg wet weight, declined approximately exponentially over the 6 weeks of the experiment, with an overall half-life of 16 days. The residence time of B(a)P in mussels makes these mollusks attractive as bioaccumulators in monitoring programs for this and other carcinogens. (Katz)
W76-12328

A BIOENERGETICS-BASED MODEL FOR POLLUTANT ACCUMULATION BY FISH. SIMULATION OF PCB AND METHYL-MERCURY RESIDUE LEVELS IN OTTAWA RIVER YELLOW PERCH (PERCA FLAVESCENS),
National Research Council of Canada, Ottawa (Ontario). Div. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-12329

LITTLE POLLUTION FROM THIS FEEDLOT.
For primary bibliographic entry see Field 5G.
W76-12350

KEEPING RUNOFF SAFE.
For primary bibliographic entry see Field 5G.
W76-12351

TRANSPORT RATE OF COD THROUGH A WET POROUS STRATUM - MEASUREMENT OF DIFFUSIVITY IN CATTLE MANURE SOLUTION,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
S. K. Choi, L. T. Fan, L. E. Erickson, and R. I. Lipper.
Transactions of the American Society of Agricultural Engineers, Vol. 14, No. 4, p. 720-726, July-August, 1971. 10 fig, 1 tab, 16 ref.

Descriptors: *Chemical oxygen demand, *Diffusivity, Water pollution, Percolation, Groundwater, Measurement, Mathematical models, *Farm wastes, *Path of pollutants.

The transport rate of materials through various soil strata is important for determining pollution potential of waterways by material introduced into the soil, at various distances from the water. A mathematical model and the equations derived from it are related to the transport of organic matter (expressed as chemical oxygen demand) through soil. The model used was packed bed, saturated with water and topped by a well mixed pool of homogeneous solution; both finite and infinite packed bed thicknesses are considered. Analytical expressions for concentration of a solute in the packed bed and in the homogeneous solution are given as a function of time, and of distance from the interface in the former case. Experimental data were obtained for a sucrose solution of known diffusivity in an experimental setsup established in accordance with the model, and for a sterilized manure solution. (East Central)
W76-12352

BEEF FEEDLOTS - A POLLUTION PROBLEM,
Agricultural Research Service, Lincoln, Neb.
For primary bibliographic entry see Field 5G.
W76-12358

ANIMAL WASTE AND NITRATE MOVEMENT THROUGH SOIL,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
J. A. Lindley, A. C. Dale, and J. V. Mannering.
Presented at the 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, 17 p. 6 fig, 11 tab, 6 ref.

Descriptors: Groundwater movement, *Nitrates, *Leaching, *Denitrification, Loam, Soil moisture, Water pollution sources, *Farm wastes, Path of pollutants, Application rates, Waste disposal.
Identifiers: *Land disposal, Silt loam, Sandy loam.

An evaluation of high application rates of animal wastes to land becomes necessary as the number of animals per acre of land increases. The application rate must be controlled to prevent ground water degradation. A laboratory study was done to evaluate the effects of waste management on nitrate movement through soil. The fate of nitrate is dependent on various conditions. The most important are soil moisture and the presence of sufficient organic matter for microbial activity. Soil type might also affect nitrate movement. Leachates of very low nitrogen concentration can be produced even with waste application of 24.6 pounds of nitrate per acre-day. The amount of nitrogen lost increases with increasing available energy (C:N ratio). (Kehl-East Central)
W76-12362

SOIL CONSERVATION SERVICE, TEXAS TECH UNIVERSITY WORKSHOP COMMITTEE ON FEEDLOT WASTE.
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12363

EFFECT OF CATTLE FEEDLOT WASTES UPON GROUND WATER--A COMMENTARY,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
W. D. Miller.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 5 p. 3 fig.

Descriptors: *Feed lots, *Groundwater, *Seepage, Pollutants, Cattle, *Farm wastes, Water pollution control, Path of pollutants, Pollutant identification.

Several categories of potential ground water pollutants are listed. These include inorganic dissolved solids; organic dissolved solids; trace metals; pesticides, insecticides and herbicides; and bacteria and bacterially derived products. Along with the effects of these potential pollutants, the feedlot geology must be considered in discussing the effects of feedlot waste on ground water. Significant factors to be examined are: surface topography, soil permeability, bedrock lithology, structure and permeability, and depth of ground water. Thus, some land areas are more susceptible to ground water pollution than others. In Texas, cases of pollution have been documented in the Edwards Plateau, the Gulf Coast, and the High Plains. Further evaluation of the ground water pollution problem is needed. A study by Miller (1971) revealed that about 15-20 percent of the cattle feedlots in the Texas High Plains showed some evidence of seepage to the water table. Average nitrate, chlorides and dissolved solids concentrations are cited. (See also W76-12363) (Kehl-East Central)
W76-12366

SAMPLING AND CALCULATION METHODS FOR DETERMINING QUANTITIES OF NITROGEN AND PHOSPHORUS IN WATERSHED RUNOFF,
Agricultural Research Service, Columbia, Mo.
For primary bibliographic entry see Field 5A.
W76-12372

PREDICTED OIL SLICK MOVEMENT FROM VARIOUS LOCATIONS OFF THE NEW JERSEY-DELAWARE COASTLINE,
Coast Guard Research and Development Center, Groton, Conn.
I. M. Lissauer, and J. C. Bacon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A019 019, $6.00 in paper copy, $3.00 in microfiche. Final Report No. USCG-D-137-75, June 1975. 132 p, 51 fig, 70 tab, 13 ref.

Descriptors: *Continental Shelf, Water quality control, *Oil spills, *Oil pollution, Water pollution sources, Resources development, *Meteorological data, *Environmental effects, *New Jersey, *Delaware, Drilling, Currents(Water), Coasts, Beaches, Shores, *Path of pollutants, *Forecasting.
Identifiers: *Outer Continental Shelf, *Deepwater ports, *New York Bight, Environmental impact, US East Coast.

Projections of the movement of oil slicks and their impact location along the shoreline of New Jersey and Delaware were determined from three potential deepwater port sites and three potential oil drilling sites. Average monthly wind speeds and directions and average monthly current patterns were used for predicting the oil slick movement. Probable areas of impact along the shoreline were indicated. (Sinha-OEIS)
W76-12376

MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-12386

MESOSCALE COMPONENT OF THE GEOSTROPHIC FLOW AND ITS TEMPORAL AND SPATIAL VARIABILITY IN THE CALIFORNIA CURRENT OFF MONTEREY BAY IN 1973-74,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 2L.

W76-12387

USE OF THE METHOD OF MATHEMATICAL DESIGN OF EXPERIMENT IN SANITARY-CHEMICAL INVESTIGATIONS OF EPOXY COATINGS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5G.
W76-12393

ORGANIC MATTER LOSSES FROM FOUR WATERSHEDS IN THE HUMID TROPICS,
East Carolina Univ., Greenville, N. C. Dept. of Biology.
M. M. Brinson.
Limnology and Oceanography, Vol. 21, No. 4, p 572-582, July 1976. 5 fig, 1 tab, 24 ref.

Descriptors: *Organic matter, *Runoff, *Humidity, *Tropical regions, Sediments, Suspended solids, Watersheds(Basins), Precipitation(Atmospheric), Rivers, Lakes, Sampling, Erosion, Drainage, Carbon, On-site investigations, Surveys.
Identifiers: *Guatemala, *Lake Izabel catchment basin, Seasonal hydrologic runoff, Organic carbon export.

Organic matter (OM) losses in runoff water were examined for four watersheds in Guatemala, ranging in size between 170 and 5,247 sq km. Total organic matter (TOM) concentrations for the largest river were highest (14.8-19.3 mg/liter) at the beginning of the wet season, due to an abrupt increase in particulate fractions. This initial flushing effect was followed by lower concentrations which had decreased to near dry season values (3.90-5.35 mg TOM/liter) 4 months later. Export of TOM was estimated to be between 5.4 and 12 g/sq m/yr for three of the four watersheds. The fourth, dominated by swamp forest, showed a higher maximum concentration (43.7 mg TOM/liter) and greater export, the latter partially attributable to flushing by floodwaters that overflowed an adjacent watershed. These data and those from studies in higher latitudes suggested a direct relationship between the quantity of TOM exported and runoff volume per unit area of watershed. A plausible explanation was that dissolved OM is the major form of OM in most running waters and varies less in magnitude than hydrologic runoff from one watershed to another. (Sims - ISWS)
W76-12428

ANALYTICAL THREE-DIMENSIONAL TRANSIENT MODELING OF EFFLUENT DISCHARGES,
Stone and Webster Engineering Corp., Boston, Mass.
G. T. Yeh, and Y. J. Tsai.
Water Resources Research, Vol. 12, No. 3, p 533-540, June 1976. 10 fig, 19 ref.

Descriptors: *Unsteady flow, *Dye releases, *Dye concentration, *Effluents, *Analytical techniques, *Turbulent flow, *Hudson River, *Mathematical models, Thermal pollution, Diffusion, Buoyancy, Density currents, Tidal waters, Equations, Pollutant identification, *Path of pollutants.
Identifiers: *Three-dimensional model, *Green's function, *Long Island Sound, Momentum.

A transient, three-dimensional turbulent diffusion equation describing the concentration distribution of a substance or heat in a time-dependent flow field was solved analytically. Two models were considered: one treated both the depth and the width of a water body as being finite, while the other dealt with finite depth but with infinite width. In the search for solutions, the method of Green's function was utilized to the optimum advantage. The solutions were developed for cases in which the velocity field can be described as any integratable function of time. For practical applications, the velocity was assumed to be the sum of a constant and a harmonic component. There were no limitations on the type of source conditions. Results were compared with field measurements and showed the models to be capable of simulating the dye distribution in tidal water bodies. The models should provide the engineering community with a quick and easy way of predicting the distribution of effluent discharges. They should obviate the need of using tedious and time-consuming numerical models, as occasions often arise in which such complicated models may not be warranted. (Lardner - ISWS)
W76-12433

AN ANALYSIS OF THE NUMERICAL SOLUTION OF THE TRANSPORT EQUATION,
Princeton Univ., N. J. Dept. of Civil Engineering.
W. G. Gray, and G. F. Pinder.
Water Resources Research, Vol. 12, No. 3, p 547-555, June 1976. 8 fig, 1 tab, 5 ref. NSF-AER74-01765.

Descriptors: *Mass transfer, *Dispersion, *Finite element analysis, *Numerical analysis, *Fourier analysis, Waves(Water), Convection, Computers, Equations, Mathematical studies, *Path of pollutants.
Identifiers: *Convective-dispersive equation, *Transport equation, Frontal smearing, Concentration overshoot, Finite difference methods.

The relative merits of numerical procedures used for the solution of the convective dispersive mass transport equation were examined in terms of frontal smearing and concentration overshoot. The testing for assessing the relative accuracy of some selected numerical procedures was based on a Fourier series representation of the solution to the governing equation and its discretized counterpart. Through a comparative examination of the analytically and numerically computed amplitude and speed of the Fourier components, the dispersive and dissipative properties of a numerical scheme were easily analyzed. The analysis indicated that the commonly observed phenomenon of overshoot of a concentration pulse was due to the inability of the numerical schemes to propagate the small wavelengths which are important to the description of the front. The numerical smearing of a sharp front was due to dissipation of these small wavelengths. The finite element method was found to be superior to finite difference methods for solution of the convective-dispersive equation. (Singh - ISWS)
W76-12434

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
A. H. Johnson, D. R. Bouldin, E. A. Goyette, and A. M. Hedges.
Journal of Environmental Quality, Vol. 5, No. 2, p 148-157, April-June 1976. 12 fig, 5 tab, 12 ref.

Descriptors: Phosphorus, *Phosphorus compounds, *Watersheds(Basins), *Sediment transport, *New York, *Phosphates, Analytical techniques, Fertilizers, Water pollution sources, Surface waters, Analysis, Chemical analysis, Water quality, Streams, Water pollution, Environmental effects, Analytical techniques, Algae, Land use.
Identifiers: *Phosphorus loss, *Stream transport, *Rural watersheds, Dissolved phosphorus, Particulate phosphorus, *Fall Creek(NY), Central New York, Nonsource point pollution, Stream sampling, Mineral constituents, Particulate forms.

Loss of dissolved and particulate phosphorus by stream transport was determined over a 20-month period for Fall Creek, a stream draining a predominantly rural watershed of 330 sq km in central New York. Samples were taken several times daily during most high flow periods and at 3 to 20 day intervals during low flow periods. Samples were usually processed within 4 hours since redistribution of P among chemical forms was rapid. Losses of P from the watershed per unit time varied by several orders of magnitude and 75% of the P loss occurred in the highest flow which occurred in 10% of the time. In reaches well downstream from major point source inputs, dissolved inorganic P concentrations were highest during storm events due to two processes: desorption of P accumulated in the bed sediment from point source inputs during low flow, and inputs from diffuse sources in surface runoff. Dissolved organic P concentrations were not correlated with flow. Approximately 20% of the dissolved P lost from the watershed was derived from diffuse sources associated with farming, 45% was derived from natural geochemical processes, and 35% from point source inputs. Less than 1% of the P applied to the landscape in chemical fertilizer and manure was lost from the watershed in dissolved form. (Henley - ISWS)
W76-12435

DISSOLVED NUTRIENT LOSSES IN STORM RUNOFF FROM FIVE SOUTHERN PINE WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. D. Schreiber, P. D. Duffy, and D. C. McClurkin.
Journal Environmental Quality, Vol. 5, NO. 2, p 201-205, April-June 1976. 2 fig, 6 tab, 21 ref.

Descriptors: Nutrients, *Storm runoff, *Water quality, *Cycling nutrients, *Nutrient removal, Nitrates, Phosphats, Chemical analysis, Leaching, Runoff, Water properties, *Watersheds(Basins), Rain, Precipitation(Atmospheric), Rainfall-runoff relationships, Cations, Baseline studies.
Identifiers: *Nutrient losses, *Southern pine watersheds, Northern Mississippi, Watershed studies, *Nutrient flux, *Coffeeville(Miss), Nutrient net gain or loss, Forested lands, Dissolved nutrients, Mineral constituents, Forest productivity, Coastal plain watersheds, Nitrate nitrogen, Ammonium nitrogen, Orthophosphates.

Storm runoff from five reforested eroded watersheds in northern Mississippi (1.5 to 2.8 ha) was analyzed during the 1973 water year to determine the concentrations of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K. Storm runoff was measured with 0.91-m H-flumes and samples collected with a Coshocton wheel sampler. Analysis of precipitation which totaled 189 cm for the year, 40% above average, revealed that inputs of NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 3.12, 5.73, 0.07, 7.72, 3.03, and 4.98 kg/ha, respectively. Soluble nutrient losses in the storm runoff on a unit area basis were similar for the five watersheds. Average losses in storm runoff of soluble NO3-N, NH4-N, PO4-P, Ca, Mg, and K for the year were 0.32, 3.35, 0.04, 6.21, 3.05, and 3.31 kg/ha, respectively. As the annual storm runoff among the watersheds increased, the NO3-N losses also increased linearly. Data for individual storms indicated that a critical storm runoff value must be exceeded before the watersheds would exhibit a net loss of each nutrient. (Henley-ISWS)
W76-12436

CHEMICAL AND MICROBIOLOGICAL DEGRADATION OF MALATHION AND PARATHION IN AN ESTUARINE ENVIRONMENT,
Gulf Coast Research Lab., Ocean Springs, Miss. Microbiology Section.
W. W. Walker.
Journal Environmental Quality, Vol. 5, No. 2, p 210-215, April-June, 1976. 3 fig, 6 tab, 26 ref.

Descriptors: *Pesticides, *Chemical degradation, *Microbial degradation, *Estuarine environment, *Organophosphorus pesticides, *Salinity, Chemical properties, Sea water, Analytical techniques, Sediments, Bacteria, Gas chromatography, Water pollution, Organic pesticides, Phosphorus com-

pounds, Path of pollutants, Pollutant identification, *Mississippi.
Identifiers: *Organophosphorus insecticides, *Malathion degradation, *Parathion degradation, Salinity effects, Pesticide chemicals, *Davis Bayou(Miss), Estuarine waters, Environmental hazards, Malathion, Parathion, Analytical procedures, Microbiological degradation, Malathion abatement, Parathion abatement.

Malation was essentially completely degraded during 18 days incubation in sterile and nonsterile water, while respective paration losses ranged from 16 to 23% after 40 days. Malathion abatement was in direct proportion to increasing salinity, while parathion was quite persistent, even in high salinity (25 parts per thousand) water. Microorganisms capable of degrading malathion and parathion were isolated from insecticide-enriched sediment. Four bacteria isolated from malathion-enriched sediment readily degraded malathion, one to malathion half-ester and another to malathion dicarboxylic acid through the half-ester intermediate, and three bacteria isolated from parathion-enriched sediment were efficient in parathion metabolism. One bacterium isolated from parathion-enriched sediment was capable of degrading malathion to the diacid through the half-ester intermediate. (Henley-ISWS)
W76-12437

SOME OBSERVATIONS ON THE CONTAMINATION OF THE COASTAL WATERS OF THE CITY OF CUMANA, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
E. A-Fernandez.
Bol Inst Oceanogr Univ Oriente Cumana. 12(1), p 23-32, 1973.

Descriptors: Europe, *Water pollution sources, Coasts, *South America, *Coliforms, *Streptococcus, Salmonella, *Industrial wastes, Sewage, Canneries.
Identifiers: *Cumana(Venezuela).

A 1 yr study was conducted to determine the degree of pollution in the coastal area near Cumana, Venezuela. Severe pollution problems were found in localized areas. Pollution sources were identified as the discharges, close to the shore line, of raw sewage and wastes from fish-canneries. Another contributing source was the Manzanares River flowing through populated areas before reaching the sea. Coliform counts reached over 108/100 ml and Streptococcus over 8 x 104/100 ml. The presence of Salmonella in the coastal waters was also investigated intermittently. --Copyright 1975, Biological Abstracts, Inc.
W76-12467

EVALUATION OF PROPOSED SEWAGE SLUDGE DUMPSITE AREAS IN THE NEW YORK BIGHT.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5E.
W76-12469

COLOR CHARACTERIZATION OF KRAFT LINERBOARD DECKER EFFLUENT,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5A.
W76-12472

WOOD FIBER BOARDS: RAW MATERIALS, DEFIBRATING CONDITIONS, WASTE WATER (TREFIBERPLATER RASTOFF -- DEFIBRERINGSBETINGELSER -- AVLOPSVANN),
Norwegian Pulp and Paper Research Inst., Oslo.
G. Rodland, and K. Helge.
Norsk Skogindustri, Vol. 30, No. 5, p 114-117, May, 1976. 12 fig, 3 ref. English summary.

Descriptors: *Waste water(Pollution), *Pulp waste, Europe, Foreign research, Pine trees, *Wood wastes, Biochemical oxygen demand, Hardwood, Softwood, Heat treatment, Time, Bark, Fibers(Plant), Pressure, Effluents.
Identifiers: *Fiberboards, *Norway, Spruce trees(Picea), Building boards, Fiber yield, *Defibration.

The Norwegian Paper Research Institute (PFI) in cooperation with Norsk Wallboard A/S. (Norway) has been investigating the effects of fiberizing conditions (8, 10, and 12 kp/sq cm pressure), pretreatments (3.5 to 7 min preheating times), and wood species (barked and unbarked spruce, unbarked pine, and hardwood slabs) on the fiber yield and the effluent BOD load in the production of pulp for building boards. A decrease in defibrator pressure from 12 to 8 kp/sq cm increased the fiber yield 4-5% for softwood and 6-7% for hardwood. Simultaneous shortening of preheating time increased yields 7-9%. Effluent BOD was clearly related to fiber yield. Hardwoods caused slightly greater BOD loads than did softwoods, but no significant differences were observed between spruce and pine or between bark and wood fibers, although bark contributes proportonately more to BOD because it reduces the fiberized yield. (Brown-IPC)
W76-12476

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
M. Iacoboni, and R. O. Blosser.
Special Report No. 76-03, 10 p, March, 1976. 1 tab.

Descriptors: *Dissolved oxygen, Natural streams, *Pulp wastes, Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Water analysis, Streamflow, Water quality, Water pollution, Waste assimilative capacity, *Path of pollutant, Monitoring, Pollutant identification.

An analysis was made of dissolved oxygen data for 77 monitoring stations below 80 pulp and paper mills during the low-flow months in the years 1954, 1964, 1969, and 1974. There was a significant increase in dissolved oxygen level between 1969 and 1974. In 82% of the cases the dissolved oxygen met or exceeded the water quality standards in 1974. In the cases where the levels were significantly less than the standard, the mill effluent comprised all or the bulk of the stream flow. (Buchanan-IPC)
W76-12480

MICROBIOLOGICAL TRANSFORMATION OF CARBON NITROGEN, SULFUR, IRON, PHOSPHORUS AND CALCIUM COMPOUNDS IN LAKE RESERVOIRS, (IN POLISH),
Polish Association of Sanitary Engineering and Technology, Warsaw.
For primary bibliographic entry see Field 5C.
W76-12494

PHOSPHATE RELEASE AND SORPTION BY LAKE MOHEGAN SEDIMENTS,
City Coll., New York. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-12512

A EUTROPHICATION MODEL FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W76-12515

LARGE SCALE SYSTEMS APPROACH TO ESTUARINE WATER QUALITY MODELLING WITH MULTIPLE CONSTITUENTS,
Texas Univ. at Austin. Dept. of Electrical Engineering.
B. R. Penumalli, R. H. Flake, and E. G. Fruh.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 2, No. 2, p 101-115, June 1976. 6 fig, 4 tab, 11 ref, 1 append.

Descriptors: *Estuaries, *Water quality, *Mathematical models, *Simulation analysis, Nitrogen cycle, Ecosystems, Environment, Management, Equations, Systems analysis, *Texas, Bays, *Model studies, *Path of pollutants.
Identifiers: Matrix model, *Corpus Christi Bay(Texas), Concentration distribution, Steady state solution.

A matrix model for simulating concentration distributions of water quality constituents with coupled reactions in an estuary is developed from a large scale systems approach. The model is an approximation to the set of coupled partial differential equations describing the process. This steady state approximation is formulated as a large algebraic system consisting of coupled subsystems. The large algebraic system is solved by an efficient iterative method. Results utilizing actual field data are presented for the nitrogen cycle with five constituent forms of nitrogen for Corpus Christi Bay, Texas. Simulated and observed concentrations are compared. (Bell-Cornell)
W76-12517

AN INTERDISCIPLINARY MATHEMATICAL MODEL APPLIED TO THE SOUTHERN BIGHT OF THE NORTH SEA,
Liege Univ. (Belgium). Institut de Mathematique.
J. C. J. Nihoul.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 2, No. 1, p 3-17, March 1976. 5 fig, 1 tab, 12 ref, 1 append.

Descriptors: *Ecosystems, *Mathematical models, *Management, *Simulation analysis, Food chain, Pollutants, Water quality, Fishing, Fish, Heavy metals, Storm surge, Tides, Coasts, Chemical analysis, Estuaries, Systems analysis.
Identifiers: *Marine ecosystem, *Southern Bight(Belgium), Prediction, Residual circulation model, Dispersion models, *Interdisciplinary model, Transfer functions, *North Sea(Southern Bight).

An interdisciplinary mathematical model based on a 5-year survey of the Southern Bight is presented; it is shown how, through a hierarchy of management-oriented submodels, a predictive description of the system can be given from tides, storm surges, residual circulation and dispersion mechanisms to the dynamics of ecosystems and the transfer of pollutants through the food chain. By providing estimates of the anticipated fish population and level of pollution, the model can assist Public Health decisions. The model can set up for management the problem of optimizing, subject to economical constraints, the tolerable inputs and the locations of sources of pollution, coastal outfalls and sea dumpings. The model integrates the contributions of more than a hundred research workers and technicians who collaborated with the Belgian National Environment Project during a 5-year period. (Bell-Cornell)
W76-12518

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-12519

POLLUTIONAL ANALYSIS OF COMBINED SEWER SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.

W76-12530

ON THE POLLUTION OF WATER OF SOME RIVERS IN THE KASUMIGAURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
Y. Takamura, S. Suzuki, T. Masaki, O. Kodama, and Y. Asada.
Sci Rep Fac Agric Ibaraki Univ. 21, p 53-63, 1973.

Descriptors: *Pollutant identification, Path of pollutants, *Rivers, Lakes, *Water pollution sources, *Industrial wastes, *Municipal wastes, Irrigation, Water quality control, Dissolved oxygen, Chemical oxygen demand, Ions, Bacteria, Coliforms, Conductivity.
Identifiers: Eutrophication causes, *Kasumigaura Lake basin(Japan).

The water of Sakura River (R), Sakai R., Shinkawa R., Seimei R. and Hanamuro R. which flow into Tsuchiura bay of the lake Kasumigaura, was quantitatively analyzed from April 1971-April 1973 to determine the degradation of water quality of rivers relating to the eutrophication of the lake. Chemical oxygen demand (COD), NH4+, NO2-, Cl-, Zn++, Cd++ ions, dissolved oxygen (DO), coliform bacteria, etc., were analyzed together with electric conductance, temperature and pH. The pollution of Sakai R. was caused by industrial waste waters from metal product plants; Hanamuro R. by food product plants; and Shinkawa R. by urban sewage. The pollution of Sakura river was relatively lower. In the lake and the river with the wider drainage basin (Sakura R.) concentrations of COD and NH4+ ion increased in spring and summer and decreased in fall and winter. In rivers with narrow drainage basins near urban environments such a seasonal change of the water quality was not observed. In those rivers rainfall affected the water quality. The water quality was remarkably affected by the supply of irrigation water from the lake Kasumigaura in spring and summer. Irrigation water caused a decrease in bacterial numbers of Hanamuro and Sakura rivers.--Copyright 1975, Biological Abstracts, Inc.
W76-12568

SEVERAL WATER CHEMISTRY DATA ON THE KNOWLEDGE OF THE SECTION OF THE DANUBE BETWEEN BUDAPEST AND TURNU SEVERIN (1645-930 KM) (DANUBIALIA HUNGARICA LXVII), (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
For primary bibliographic entry see Field 5A.
W76-12574

HYDROCARBON RESIDUES IN IVORY COAST WATERS,
For primary bibliographic entry see Field 5C.
W76-12579

THE LINKAGE BETWEEN CHEMICAL POLLUTION AND BACTERIOLOGICAL POLLUTION IN COASTAL ZONES. (RECHERCHE D'UNE LIAISON ENTRE LA POLLUTION CHIMIQUE ET LA POLLUTION BACTERIOLOGIQUE DANS LES ZONES LITTORALES),
Commissariat a l'Energie Atomique, Pierrelatte (France).
M. Archimbaud, and C. Trouve.
Water Research, Vol. 10, No. 3, p 225-229. 3 fig, 2 tab, 10 ref.

Descriptors: Water pollution, *Water quality control, *Coliforms, Chemical analysis, *E. coli, *Bacteria, *Ammonia, *Detergents, Sewage effluents, Sampling, *Pollutant identification, *Path of pollutants.
Identifiers: *Marseille(France), *Bacteriological analysis.

Analysis of water samples taken from 4 locations near Marseille, France, in the Etange de Berre (Baie de Vaine, Baie de St. Chamas) and in the Mediterranean Sea near the Marseille Sewer at Cortiou is reported. The study was undertaken in order to view correlations between pollution as measured by bacteriological and chemical indicators, particularly in waters which are meant for swimming. Since chemical analysis is the faster of the 2 techniques, it would be possible to use these measures to quickly and precisely survey areas of possible pollution. Samples were taken (146 in total) and sent to a laboratory for bacteriological analysis and chemically analysed in a mobile laboratory at the sampling site. For the former, the number of coliform bacteria and escherichia coli were counted and for the latter detergent anions and ammonia were measured. Visual analysis of the figures obtained revealed that an attempt to correlate the figures mathematically would be statistically biased because of the form of the distributions. Each of the measures was divided into 3 sections: weak, medium and strong concentrations. This revealed interesting results. A first estimation is that for all samples where the concentration of detergents is greater than 350 micrograms per litre corresponds to water polluted by bacteria and all samples where the concentration of detergents were less than or equal to 300 micrograms per litre and ammonia was less than 100 micrograms per litre is non-polluted water. These definitions would permit a decision in perhaps two-thirds of all areas studied and the area of uncertainty could perhaps be narrowed with further study and other environmental and meteorological parameters could be taken into account. (Smith - North Carolina)
W76-12590

SOME OBSERVATIONS REGARDING PENTACHLOROPHENOL LEVELS IN HAVERFORD TOWNSHIP, PENNSYLVANIA,
Villanova Univ., Pa. Dept. of Chemistry.
J. E. Fountaine, P. B. Joshipura, and P. N. Keliher.
Water Research, Vol. 10, No. 3, 1976. p 185-188, 3 fig, 2 tab, 9 ref.

Descriptors: *Water pollution sources, *Sampling, *Water pollution control, *Phenols, *Pesticide residues, Toxins, Chemical analysis, *Pennsylvania, *Path of pollutants, *Pollutant identification, Herbicides, Insecticides.
Identifiers: *Naylor's Run Creek(Penn), *Pentachlorophenol, Haverford Township(Penn).

Pentachlorophenol (PCP) is used extensively as a herbicide, fungicide and insecticide, and with a worldwide production annually of more than 20,000 tons, it represents a possible toxic pollutant, even when concentrations reach levels as low as .2 parts per million. Naylor's Run Creek (PA) was analysed for this compound because of suspected pollution. Samples from the creek were analysed using several spectographic and chromographic techniques. Concentrations of PCP ranged from .1 to 10 ppm. They were highest near the stream source and near a factory and lowest downstream. Since PCP does not decompose readily, it must be either absorbed or diluted while it goes downstream. For one sample a bottle containing water from the stream was left to stand for two days after which samples were withdrawn from various levels in the bottle. It was found that the concentration dropped as depth in the bottle increased, so that it is possible that the PCP is slowly diffusing from the oil slick which is present in the stream and the bottle. From this and other analysis the rate of PCP discharge was estimated at about 13.3 grams per hour into the stream. Though it might seem easy to combat this pollution by closing the factory, a definite source of PCP, seepage of PCP from the ground would most likely continue. It would be possible to skim oil from the stream to reduce pollution or use a coagulation system. Decomposing bacteria and macroreticular resin bed would also help. (Smith-North Carolina)
W76-12591

NITROGEN AVAILABILITY IN URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
W. F. Cowen, K. Sirisinha, and G. F. Lee.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 339-345, February, 1976. 4 fig, 16 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Nitrogen, *Urban runoff, *Chemical reactions, Organic compounds, Ammonia, Nitrites, Nitrates, Bacteria.
Identifiers: Mineralization, Ammonia nitrogen, Nitrite nitrogen.

A series of mineralization tests were performed to study the reactions in which organic nitrogen is converted to ammonia nitrogen, which is converted to nitrite nitrogen, which is converted to nitrate nitrogen in urban runoff under the influence of the bacteria in the runoff. Grab samples of urban runoff were collected from street gutters and open storm sewers in a low density residential area, a medium density area, and a university campus in Madison, Wisconsin. The samples were chemically analyzed for ammonia nitrogen, nitrate nitrogen, total Kjeldahl nitrogen (TKN), and soluble Kjeldahl nitrogen (SKN). Nitrite nitrogen concentrations were assumed to be negligible. Runoff samples were then incubated in darkness for 82 to 100 days at 21 C and analyzed for ammonia nitrogen and nitrate nitrogen at intervals. The concentration of algal-available nitrogen was computed and the TKN and SKN values determined. The mineralized waters contained from 57% to 82% of total nitrogen as algal-available nitrogen, with an average of 70%. Since algal-available nitrogen in the fresh runoff samples ranged from 4 to 66% of total nitrogen, the influence of bacterial mineralization on the release of inorganic nitrogen from the runoff to the waters receiving the runoff is readily apparent. Gross underestimates of available total nitrogen could result if only the inorganic nitrogen data from chemical analyses of fresh runoff are considered. The mineralization of organic nitrogen forms should be considered in any estimates of the true, biologically important nitrogen loadings from urban runoff. (Snyder-FIRL)
W76-12596

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W76-12627

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W76-12628

PERSISTENCE OF VIRUS ON SEWAGE-IRRIGATED VEGETABLES,
Ohio Bureau of Foods, Cincinnati. Virology Branch.
E. P. Larkin, J. T. Tierney, and R. Sullivan.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE1, p 29-35, February, 1976. 3 tab, 23 ref, append.

Descriptors: *Waste water treatment, *Pollutant identification, *Viruses, *Persistence, *Irrigation effects, Sewage treatment, Activated sludge, Sewerage, Irrigation practices, Irrigation water, Sewage effluents.
Identifiers: *Spray irrigation.

The persistence of a human enterovirus, poliovirus 1, on lettuce and radishes fertilized with contaminated sewage wastes was studied. The contaminated wastes were obtained by mixing a suspension of poliovirus 1 with raw waste ac-

tivated sludge or secondary sewage effluent which contained no naturally occurring viruses. They were applied with an apparatus simulating existing spray irrigation equipment. Filtrate from slurries of crushed lettuce, radish leaves, and radishes was assayed for virus using a plaque-forming method. Poliovirus 1 persisted on lettuce and radishes for up to 36 days. Since present treatment systems do not completely remove viruses from sewage sludge or effluent, municipalities contemplating sewage disposal on land should investigate the use of crops other than those in the food chain until treatment and monitoring methods are sufficiently improved to preclude the seeding of food crops with human pathogens. (Snyder-FIRL)
W76-12634

MIXING AND TRANSPORT, (LITERATURE REVIEW),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
J. D. Ditmars.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1620-1639, June, 1976. 199 ref.

Descriptors: *Mixing, *Dispersion, Hydrodynamics, *Groundwater, *Surface waters, Lakes, Oceans, Estuaries, Rivers, Reservoirs, Bays, Streams, Model studies, Industrial wastes, Waste water, Marshes, Drainage systems, Oil, Circulation, *Reviews, *Bibliographies, Path of pollutants.
Identifiers: *Literature reviews.

A literature review of mixing and transport phenomena associated with surface waters and groundwater is presented. Specific topics discussed include: longitudinal dispersion processes in rivers; procedures for determining the assimilation capacity of streams; the hydrodynamics of large lakes; a model for the diurnal temperature distribution in a deep reservoir; a classification scheme for numerical models of water and waste movement in tidal bays and esturies; measurements of a salt marsh drainage system; water quality forecasts for a number of small bays on the Florida coast; the development of finite-element models for one- and two-layer coastal circulation; the fluid mechanics of waste water disposal in the ocean; studies on the discharge of heated waters into rivers, lakes, estuaries, and oceans; the design and operation of a recirculating flume for the development of criteria for power plant intake screens; the effect of high initial dilution on the dispersion of fluid-solid mixtures dumped into the oceans; and dentudies on the spreading of oil on water surfaces under different conditions. (Kreager-FIRL)
W76-12672

5C. Effects Of Pollution

THE EFFECTS OF CADMIUM ON FRESHWATER PHYTOPLANKTON,
Vermont Univ., Burlington. Dept. of Biochemistry.
B. A. Hart, and P. W. Cook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 547, $5.50 in paper copy, $3.00 in microfiche. Vermont Water Resources Research Center, Burlington, Completion Report, July 1975, 106 p. OWRT A-016-Vt(1).

Descriptors: *Cadmium, Heavy metals, Lakes, *Phytoplankton, Plankton, Plant growth, Acidity, Food chains, Inhibition, Photosynthesis, Carbon dioxide, Oxygen, Water pollution effects.

Effects were determined of cadmium on selected species of freshwater algae, including strains isolated from the plankton. Total growth of mixed phytoplankton cultures exposed for 8 days to 0.50 ppm Cd was 25% of control cultures. Certain diatoms, flagellates, and blue-green algae appeared to be most sensitive to Cd whereas 2 genera of diatoms (Nitzschia and Flagilaria) and green algae such as Chlorella were relatively resistant. The results indicate that: (1) natural phytoplankton are sensitive to Cd present in the water in which they are growing; (2) Cd has a selective effect upon different species within a heterogeneous population; (3) a similar selective effect can also be demonstrated with uni-algal cultures exposed to Cd; (4) resistant algal strains can concentrate as much as 500-fold greater concentrations than present originally in the growth medium and thus could pose a potential hazard to the food-chain; (5) the extent to which Cd is accumulated is a function of the acidity and the electrolyte composition of the aquatic environment; (6) cultures grown in non-lethal concentrations of Cd have reduced ability to carry out the photosynthetic activities of oxygen evolution and carbon dioxide fixation; (7) the degree of inhibition of CO2 fixation and O2 evolution is directly related to the sensitivity of the organism to cadmium.
W76-12152

HYDROLOGIC IMPACT OF BURNING AND GRAZING ON A CHAINED PINYON-JUNIPER SITE IN SOUTHEASTERN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 4C.
W76-12153

FURTHER THERMAL ADDITION STUDIES AT CRYSTAL RIVER, FLORIDA WITH AN ANNOTATED CHECKLIST OF MARINE FISHES COLLECTED 1969-1971,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
J. A. Mountain.
Fla Dep Nat Resour Mar Res Lab Prof Pap Ser. 20, p 1-103. 1972.

Descriptors: *Florida, Marine fish, Data collections, Stations, Ecological distribution, *Environmental effects, Spawning, Hydrography, Surveys, *Estuarine environment, Steam, Electric powerplants, Thermal water, Nuclear powerplants, Discharge(Water), Channel flow, *Water temperature, Salinity, Trace elements, Oysters, *Water pollution effects, *Thermal pollution, Fish physiology, Copper, Statistical methods, Algae.
Identifiers: *Crystal River(Fla), Coal pile runoff water, Diversity indexes.

Hydrographic and biological data collected during the first 6 mo. of 1971 are presented. These, plus 1969 and 1970 data, complete an ecological survey of estuarine and coastal areas near Florida Power Corporation's Crystal River, Florida, steam electric generating station. This base line information should be compared with data collected after a nuclear generator becomes operational (mid-1974 or later). Discharge canal temperature was directly related to electricalpower output, with 2 daily peaks and a notable decrease from the late night to early morning. A wide range of salnities occurred in the study area. Trace metal levels from oysters near the power plant are also presented. Highest Cu levels were recorded in April 1971 (63.0 ppm) and Oct. 1969 (80.0 ppm). Correlatives may include spawning activity, increased metabolic rates, and Cu ions in coal pile runoff water. Distribution of benthic algae and invertebrates was similar to that previously reported. An annotated checklist of fishes collected during the 2 1/2 yr study is appended. Based on some 33,000 specimens (53 families), the list includes 95 identified species plus 9 either grouped together or identified to genus only. Diversity indices (S-1/LeN) were calculated from 1971 fish data and comparable periods in 1969 and 1970. The patterns of values for stations nearer river influence differed from the pattern at more remote stations.--Copyright 1973, Biological Abstracts, Inc.
W76-12163

HYDROGRAPHY AND PHYTOPLANKTON OF THE COAST OF CASTELLON, FROM SEPTEMBER 1969 TO JANUARY 1971, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Barcelona (Spain).
For primary bibliographic entry see Field 5A.
W76-12164

POTENTIAL EFFECTS OF FOREST MANAGEMENT PRACTICES ON STORMFLOW SOURCES AND WATER QUALITY,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
R. S. Beasley.
In: Proceedings, Mississippi Water Resources Conference 1976, p. 111-117. 1976. 34 refs. Water Resources Research Institute, Mississippi State University.

Descriptors: *Subsurface flow, *Sewage disposal, *Sediment yield, Water quality, *Soil water movement, Overland flow, Erosion, Forest management, *Mississippi, Coastal Plains, Limbering, Sites, Land use, Planning, Forest management, Storm runoff.

Disturbances from clearcut logging, intensive site preparation, and sewage disposal on forest lands may alter the normal flow processes and impair water quality. Especially vulnerable are stormflow source areas and sites subject to rapid subsurface flows. Skid trails are the primary source of sediment from logging; but increased water yields after cover removal expand source areas, increase overland flows, and initiate sheet and rill erosion. Litter decomposition after clearcutting exposes mineral soil and promotes surface sealing which reduces infiltration and increases overland flow and sediment yield. Increased flow through macrochannels may accelerate erosion within the openings and increase sediment delivery to streams even in the absence of surface erosion. Intensive site preparation often removes all vegetation and most of the forest floor, compacts the soil surface, and seals macrochannel openings, thereby altering the normal flow processes. Sewage effluent disposed on source areas and sites with rapid subsurface flows may pass unaltered through macrochannels or overland to stream channels, posing serious pollution problems. The key to minimizing hydrologic impacts of forest management is to categorize each site according to its suitability for specific treatments, recognizing the variable rather than fixed nature of stormflow source areas. (Forest Service)
W76-12173

MERCURY IN WADERS FROM THE WASH,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5A.
W76-12176

SUB-LETHAL EFFECTS OF CHLORINATED HYDROCARBONS ON BIVALVES,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
P. Roberts.
Marine Pollution Bulletin, Vol. 6(2), 1975, pp. 20-24, 1 tab., 5 fig., 14 ref.

Descriptors: *Animal behavior, *Benthic organisms, *Clams, *Toxicity, Animal physiology, *Respiration, *Chlorinated hydrocarbon pesticides, Physiology, Behavior, Mollusks, *DDT, *Polychlorinated biphenyls, *Dieldrin, *Endrin, Environmental effects, Mussels.
Identifiers: *Endosulfan, Oxygen consumption(Bivalves), Heart beat, Mya arenaria, Pecten maximus, Mytilus edulis, HEOD, Sub-lethal effects.

Chlorinated hydrocarbon pesticides are present in low concentration in most waters. While generally

not causing direct mortality so far as is known, they may well have sub-lethal effects, reducing the health and viability of marine organisms. In this study the effect of Endosulfan, endrin, DDT and dieldrin on respiration, heart beat and burrowing of some marine bivalves has been examined. The tests included in this study broaden the scope of toxicity testing using bivalves and illustrate a range of potential tests by which pollutant toxicity might be gauged. (Katz)
W76-12177

THE TROPHIC STATE OF NORTH CAROLINA LAKES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
C. M. Weiss, and E. J. Kuenzler.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 491, $10.50 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 119, July 1976. 224 p, 1 fig., 63 tab, 62 ref, 2 append. OWRT A-078-NC(2), 14-31-0001-5033.

Descriptors: *Trophic level, *Eutrophication, *Mesotrophy, *Oligotrophy, *Lakes, Reservoirs, Water quality, Conductivity, Nutrients, Phosphorous, *North Carolina, Impoundments, Water pollution effects, Phytoplankton, Secchi disk, Monitoring.
Identifiers: *Pollution index, *Trophic scale.

Water quality data assembled over the period 1971-1975 from the lakes and impoundments of North Carolina constituted a data pool of 854 observations that were used to describe their trophic state. Each of the 854 observation was considered a microcosm and was described in terms of its physical and chemical environment and the contained microflora (phytoplankton). By means of computerized sorting procedures and examination of known and implied relationships of more than 20 variables for each observation it was determined that total phosphorus, conductivity, and the pollution index had the most consistent and strongest correlations with measure of trophic state. Utilizing these, plus Secchi disk depth, a six-step trophic scale was defined for North Carolina waters ranging from oligotrophic to hypereutrophic. A total of 69 lakes, reservoirs, or subsegments of reservoirs were accordingly classified: 8 oligotrophic; 15 oligo-mesotrophic; 24 mesotrophic 17 alpha-eutrophic; 3 beta-eutrophic; and 2 hypereutrophic. Relating this six-step trophic scale to the mean depth of 41 of these bodies of water revealed a strong and significant negative correlation that identified a mean depth of 15-20 ft. as being a critical value for waters of high quality, low on the trophic scale. It is recommended that trophic state monitoring in North Carolina be based upon the variable total phosphorus, conductivity and Secchi disk transparency. (Stewart-North Carolina State)
W76-12210

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS, PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART I: PHOTOSYNTHETIC PRODUCTION AND ENERGY CONVERSION IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
G. W. Comita, and E. G. Wolf.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 734, $3.50 in paper copy, $3.00 in microfiche. North Dakota Water Resources Research Institute, Fargo, Research Report, No. WI-222-006-75, March 1975. 10 p, 6 fig, 4 tab. OWRT B-001-NDAK(3). 14-01-0001-882.

Descriptors: *Phytoplankton, Solar radiation, *Primary productivity, *North Dakota, *Photosynthesis, *Energy conversion, Lakes, Water pollution effects.
Identifiers: Spiritwood Lake(ND).

Gross integral production in Spiritwood Lake, North Dakota, measured by the light and dark bottle method from June 6 to September 7, 1966, was 111.1 cal per sq. cm for a solar radiation energy conversion efficiency of 0.36 per cwt. Estimates for the entire year yielded 159.2 cal per sq. cm and an efficiency of 0.19 per cwt. Integral phytoplankton respiration (June 6 through September 7) was 23.6 cal per sq. cm or 21.2 percent of integral gross production, from which a P-to-R ratio of 5.03 was calculated. Integral net phytoplankton production for the summer was 87.5 cal per sq. cm for an efficiency of 0.28 percent. This value for the entire year (8.3 months) was 121.3 cal per sq. cm or 0.20 percent of the available incident solar radiation. (See also W76-12214)
W76-12213

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka, and J. W. Held.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 735, $3.50 in paper copy, $3.00 in microfiche. North Dakota Water Resources Research Institute, Fargo, Research Report, No. WI222-006-75, March 1975, 18 p, 3 fig, 3 tab, 17 ref. OWRT-B-001-NDAK(3). 14-01-0001-882.

Descriptors: *Eutrophication, Nutrients, *North Dakota, Lakes, *Nitrogen, *Phosphorus, Estimating, Water pollution sources, Water pollution effects, *Algal control, Algicides.
Identifiers: *Spiritwood Lake(ND), Cutrine, Hydrothol.

Sources and possible means of control of algal blooms in Spiritwood Lake, a popular recreational lake, were investigated during the summer of 1970. The objective was to provide a preliminary estimate of sources of nitrogen and phosphorus and to recommend necessary research approaches toward solving eutrophication problems of the lake. Of the estimated nitrogen and phosphorus entering the lake during spring runoff, 62 percent of the nitrogen and 95 percent of the phosphorus appeared to come from diffuse land surface sources, such as drainage from fields and grasslands. Nitrogen, and to a lesser degree phosphorus, in livestock excrement are potentially important contributors to nutrient enrichment. Field experiments indicated that additions of inorganic nitrogen increased algal production whereas phosphorus inhibited it. (See also W76-12213)
W76-12214

ENVIRONMENTAL ANALYSIS FOR BAHAMAS SUPERTANKER PORT,
Erindale College (Ontario).
For primary bibliographic entry see Field 5G.
W76-12222

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH A PIPELINE LANDFALL IN COASTAL DUNES AT CRUDEN BAY, ABERDEENSHIRE, SCOTLAND,
Aberdeen Univ. (Scotland).
For primary bibliographic entry see Field 5G.
W76-12223

ENVIRONMENTAL CONSIDERATIONS OF OFFSHORE GENERATING STATIONS,
Public Service Electric and Gas Co., Newark, N.J.
For primary bibliographic entry see Field 5G.
W76-12225

CONTAMINANT EFFECTS ON BIOTA OF THE NEW YORK BIGHT,
State University of New York at Stony Brook. MESA New York Bight Project
J. S. O'Connor.
In: Gulf and Caribbean Fisheries Institute, Proceedings, Twenty-Eighth Annual held in Bal Harbour, Florida, October 1975, May 1976. p 50-63, 8 fig, 23 ref.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, *Waste disposal, Fish, Shellfish, Bacteria, Coliforms, Heavy metals, Flotsam, Biota, Coasts, Ecology.
Identifiers: *Outer Continental Shelf, *New York Bight, Ocean dumping, Antibiotics, Environmental impact.

The Marine EcoSystems Analysis (MESA) Project of NOAA was initiated in 1973 to assess the impacts of man's activities and the natural influences on the New York Bight. Several examples of contaminant impacts on marine resources have been identified rather quickly: (1) high prevalence of diseases in several species of finfish and shellfish; (2) major alterations in the distribution and abundance of bottom living organisms; (3) widespread distribution in exceptionally high numbers of coliform and fecal coliform bacteria, indicative of pathogenic bacteria (which findings have led to closure of clam fishing operations in extensive areas around and landward of ocean dumping sites); (4) presence of transfer-resistant (R+) bacteria which are resistant to broad spectra of heavy metals and antibiotics; and (5) noxious concentrations of suspended particulate material, flotsam and surface slicks, particularly on beaches used very intensively for bathing and sportfishing. (See also W76-12226) (Sinha - OEIS)
W76-12229

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 5: EFFECTS OF LONGREACH STREAM CHANNELIZATION ON DISTRIBUTION AND ABUNDANCE OF FISHES,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12230

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 4: THE EFFECTS OF LONGREACH CHANNELIZATION ON HABITAT AND INVERTEBRATE IN SOME IOWA STREAMS,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12231

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT NO. 3 SOME EFFECTS OF SHORT-REACH CHANNELIZATION ON FISH AND FISH FOOD ORGANISMS, IN CENTRAL IOWA WARM WATER STREAM,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12232

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 2. A STUDY OF THE IM-

PACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12233

WARM WATER STREAM ALTERATION IN IOWA: EXTENT, EFFECTS ON HABITAT, FISH, AND FISH FOOD, AND EVALUATION OF STREAM IMPROVEMENT STRUCTURES (SUMMARY REPORT),
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12235

TOXICITY OF AMMONIA, NITRITE ION, NITRATE ION, AND ORTHOPHOSPHATE TO MERCENARIA MERCENARIA AND CRASSOSTREA VIRGINICA,
Delaware Univ., Lewes. Coll. of Marine Studies.
C. E. Epifanio, and R. F. Srna.
Marine Biology, Vol. 33, p. 241-246, 1975. 2 tab., 23 ref.

Descriptors: *Feeding rates, Animal behavior, *Juvenile growth stage, *Oyster, *Clams, *Lethal limit, *Shellfish, *Toxicity, Commercial shellfish, *Bioassay, *Nitrites, *Nitrates, *Ammonia, Ions, *Phosphates, Aquiculture, Environmental effects, Water pollution effects, Laboratory tests, Invertebrates, Marine animals, Mollusks.
Identifiers: Sublethal limits, *Orthophosphates.

The 96-h lethal tolerance limits of the hard clam Mercenaria mercenaria and the oyster Crassostrea virginica to ammonia, nitrite and nitrate ions, and orthophosphate were defined. The lethal limit ranged from 110 to 880 mg/l for ammonia and from 1081 to 2415 mg/l for nitrite ion. Nitrate ion and sodium phosphate showed little if any toxicity at the highest test levels. Sublethal effects of the chemicals upon the rates at which the shellfish removed algal cells from suspension were studied. Sub-lethal toxic concentrations of ammonia, 7.2 mg/l, might be achieved in stressed natural environments. Hard clams and oysters are extremely tolerant to these substances in comparison to other marine and aquatic species. (Katz)
W76-12237

EFFECTS OF TEMPERATURE AND SALINITY ON GROWTH AND UPTAKE OF 65ZN AND 137CS FOR SIX MARINE ALGAE,
Saint Andrews Presbyterian Coll., Laurinburg, N. C. Div. of Mathematics and Natural Science.
C. E. Styron, T. M. Hagan, D. R. Campbell, J. Harvin, and N. K. Whittenburg.
Journal of the Marine Biological Association of the United Kingdon, Vol. 56, No. 1, p. 13-20, 1976, 3 fig., 1 tab., 20 ref.

Descriptors: *Marine algae, *Growth rate, Radioactivity, *Radioisotopes, Environmental effects, *Absorption, *Chlamydomonas, *Zinc radioisotopes, *Salinity, *Temperature, *Bioassay, Zinc, Cesium, Algae, Laboratory tests, Metals, Alkali metals, Fallout, Path of pollutants, Regression analysis, Thermal pollution, Water pollution effects.
Identifiers: *Bioaccumulation, Achnanthes sp., Carteria sp., Dunaliella sp., Phaeodactylum sp., Nannochloris sp., *Cesium radioisotopes.

Population growth and concentration factors for 65Zn and 137Cs were measured for Achnanthes brevipes, Carteria sp., Chlamydomonas sp., Dunaliela salina, Nannochloris atomus, and Phaeodactylum tricornutum subjected to factorial combinations of eight temperatures (6-40 C) and ten salinities (3.4-44.0 p.p.t.). Regression coefficients were calculated for polynomial models describing response surfaces for growth and radionuclide concentration. Salinity was more important than temperature in describing population growth for Carteria, Dunaliella, Nannochloris and Phaeodactylum. Temperature accounted for more variation in 65Zn concentration factors than salinity or population growth in all algae Dunaliella. Concentration factors for 65Zn were uniformly higher than 137Cs concentration factors. (Katz)
W76-12238

LEAD NITRATE POISONING IN THE CARP (CYPRINUS CARPIO L.):LOCALIZATION OF THE POLLUTANT IN THE BODY, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
For primary bibliographic entry see Field 5A.
W76-12251

HYGIENIC AND TOXICOLOGICAL EVALUATION OF SOME GRADES OF RUBBER USED IN DOMESTIC WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Municipal Sanitary-Epidemiological Center, Moscow (USSR).
G. L. Sardarova.
Gig Sanit. 4, p 103-104, 1974.

Descriptors: Toxicity, Public health, Rubber, Domestic water, Water supply, Corrosion control, Protective coating, Organoleptic properties, Rodents.
Identifiers: Aldolase, Blood, Liver.

Results of a hygienic and toxicological evaluation of rubbers Nos. 1976, 2566 and 1751 used for anticorrosive coatings are presented. The investigation showed the possibility of using rubbers Nos. 1751 and 1976 as anticorrosive coatings on water lines and that rubber No. 2566 cannot be used, since it has an unfavorable effect on the organoleptic properties of water. In a 5-mo. experiment in which rats received daily a 3-day infusion of water on the investigated rubber specimens as drinking water, no significant changes were noted in the condition of the animals, their weight, condition of the peripheral blood, blood coagulation, liver function, content of blood metHb and activity aldolase. --Copyright 1975, Biological Abstracts, Inc.
W76-12252

EFFECT OF LINDANE ON TROUT FRY (SALMO IRIDEUS GIBB.) CHANGES IN GLYCOLYTIC ENZYMES, (IN FRENCH),
Paris-7 Univ. (France). Lab. of Comparative Anatomy.
H. Boulekbache, and C. Spiess.
Bull Soc Zool Fr. 99(1), p 79-85, 1974.

Descriptors: *Trout, *Insecticides, *Fry, *Growth stages, *Metabolism, Carbohydrates, Water pollution effects, Enzymes.
Identifiers: Aldolase, Dehydrogenase, Kinase, Lactate, *Lindane, Liver, Muscle.

S. irideus fry is highly sensitive to lindane (an insecticide) treatment, the sensitivity increasing with the stage of development from hatching to yolk-sac resorption. The effect is revealed by marked changes in the histological structure of the liver and muscle as in the levels of the glycolytic enzymes: lactic-dehydrogenase (LDH), pyruvate kinase, aldolase as well as phosphoglucomutase. The decrease in LDH activity is especially noted. A modification in carbohydrate metabolism of trout fry when exposed to lindane is possible. --Copyright 1975, Biological Abstracts, Inc.
W76-12253

DEGRADATION OF DDT IN AN EVERGLADES MUCK AS AFFECTED BY LIME, FERROUS IRON AND ANAEROBIOSIS,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 5B.
W76-12254

PRINCIPLE OF A TECHNICAL DEVICE FOR THE STUDY OF TOXIC EFFLUENTS IN WATER POLLUTION, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Ecophysiologi des Animaux.
For primary bibliographic entry see Field 5A.
W76-12255

STUDIES ON OIL POLLUTION AND SEABIRDS IN DENMARK 1968-1971,
Game Biology Station, Ronde (Denmark).
A. H. Joensen.
Dan Rev Game Biol. 6(9), p 1-32, 1972.

Descriptors: *Oil pollution, *Oil spills, Water pollution effects, *Birds, Waterfowl, *Ducks(Wild), Mortality.
Identifiers: *Denmark, *Seabirds, Seaducks.

The purpose of the studies on oil pollution was 2-fold: firstly, to examine the extent of oil pollution and obtain as good an estimate as possible of the number of birds killed, and secondly, by examination of the dead birds, to obtain information on the age and sex-composition of the seaduck populations. The results of studies made during July 1968-June 1971 are given. In addition to general recording of cases of oil pollution, detailed studies were made of 5 large disasters. The maintenance of a rich fauna of seabirds, and especially seaducks, not only in Denmark but the whole of Western Europe, requires measures in Danish waters against the minor cases of pollution now occurring, such that their future extent is decreased.--Copyright 1975, Biological Abstracts, Inc.
W76-12256

ISOLATION OF PARASITIC AND SAPROPHYTIC STRAINS OF BDELLOVIBRIO BACTERIOVORUS FROM NATURAL WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
For primary bibliographic entry see Field 5A.
W76-12262

A RED BLOOM IN HORN SO NEAR LEMVIG (N. W. JUTLAND), CAUSED BY THE DINOFLAGELLATE OXYRHIS MARINA, (IN DANISH),
Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology.
J. Kristiansen.
Flora Fauna. 80(3), p 65-69, 1974.

Descriptors: *Dinoflagellates, Lakes, Europe, *Eels, *Ecological distribution, Fishkills, Oxygen, Water pollution effects, Toxicity, Toxins.
Identifiers: Jutland, Lemvig, *Oxyrrhis-marina, *Red bloom(Lakes), *Horn So(Denmark).

On Sept. 24, 1973, it was observed that the water of Horn So, a small lake near Lenvig (N. W. Jutland), was colored intensely red. At the same time 200 kg of eels kept in tanks in the lake were killed. The lake is connected with the Limfjord and has a salinity of about 24 0/00. The red color was due to a mass development (about 300,000 cells/ml) of the apochlorotic dinoflagellate O. marina Duj. This organism is described, and details of its distribution and ecology are discussed. The fish kill is supposed to have been caused by Oxyrrhis, but it could not be decided whether toxic substances produced by this organism or oxygen deficiency were responsible. References are made to similar blooms of other dinoflagellates, but blooms of Oxyrrhis, causing fish kills, have apparently not been recorded previously.--Copyright 1975, Biological Abstracts, Inc.
W76-12264

SPECIFIC FEATURES OF PHYTOPLANKTON IN THE LOWER COURSE OF THE IRTYSH RIVER, (IN RUSSIAN),
Tyumenskii Gosudarstvennyi Meditsinskii Institut (USSR).
E. I. Yurova.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk. 1, p 133-135, 1974.

Descriptors: *Phytoplankton, *Systematics, *Algae, *Cyanophyta, Effluents, Rivers, *Eutrophication, Water pollution effects.
Identifiers: Asterionella-formosa, Cyanarcus-hamiformis, Fragilaria-crotonensis, Melosira-distans-var-alpigena, Melosira-granulata-var-granulata, Melosira-islandica-F-islandica, Microcystis, Scenedesmus, Tetracus-ilsteri, *USSR(Irtysh River).

During years of research 297 water-plant taxa were registered in the lower course. Only 112 forms are common of the middle and lower course. Double species structure enrichment of the leading groups of algae is registered near the river-mouth. Prevalent forms of the low Irtish (USSR) biocenoses are Melosira granulata (Ehr.) Ralfs var. granulata, Fragilaria crotonensis Kitt. Asterionella formosa Hass. A variety of Scenedesmus and Microcystis species is presented. A series of genera new to Irtish is given in this article including Melosira islandica O. Mull. f. islandica, M. distans (Ehr.) Kutz. var. alpigena etc. Uncommon water-plants have been registered such as Tetracus ilsteri Skuja, Cyanarcus hamiform is Pasch. The conclusion concerns the influence of flood-lands reservoir effluents promoting the enrichment of the phytoplankton of Low Irtish. Sometimes blue-green algae play an important part.--Copyright 1975, Biological Abstracts, Inc.
W76-12267

SUCCESSION OF PLANKTON DIATOMS IN TOKYO BAY, (IN JAPANESE),
Tokyo Univ. (Japan). Ocean Research Inst.
R. Marumo, and M. Murano.
Mer (Tokyo). 11(2), p 70-82, 1973.

Descriptors: *Succession, *Planktons, *Diatoms, Bays, Cyanophyta, Algae, Copepods, Crustaceans, Asia, Standing crops, *Eutrophication, Red tide, Distribution, Water pollution effects, *Dinoflagellates, Primary productivity.
Identifiers: Chaetoceros-affinis, Chaetoceros-debilis, Chaetoceros-decipiens, Chaetoceros-socialis, Chaetognaths, Coscinodiscus, Ditylum-brightwellii, Diversity, Eucampia-zoodiacus, Eutrophication, Nitzschia-seriata, Rhizosolenia-setigera, Skeletonema-costatum, Thalassionema-nitzschioides, Thalassiosira, *Tokyo Bay(Japan).

The succession of plankton diatoms in Tokyo Bay (Japan) was studied, on the basis of the investigations carried out in 1947, 1966-68 and 1972-73. The species number was smaller in the bay than in Uraga Channel as to diatoms as well as blue-green algae, dinoflagellates, copepods, cladocera and chaetognaths. Recently, any oceanic species of these taxonomic groups have not been found in the inner part of the bay. The number of diatom species in the inner part of the bay was 35 in 1947, 28 in 1966-68 and 23 in 1972-73. Oceanic diatoms amounted to 12 spp. in 1947, but they disappeared in the latter 2 periods. Dominant diatoms in the bay were Chaetoceros affinis, C. decipiens, Rhizosolenia setigera, Skeletonema costatum, Nitzschia seriata and Thalassionema nitzschioides in 1947 and Chaetoceros debilis, C. socialis Coscinodiscus spp. Thalassiosira spp., Eucampia zoodiacus, Ditylum brightwellii, Rhizosolenia setigera Skeletonema costatum and Nitzschia seriata in 1966-68 and 1972-73. The diatom community in 1927 was somewhat different from that in 1947, but oceanic diatoms were distributed in both these years. The frequent occurrence of diatom red tides since the 1950's suggests that the diatom standing crop had remarkably increased in the bay in recent years. S. costatum had been the most important species as a red tide organism as well as in the standing crop in usual distribution in the bay from 1947 on, Judging from the succession of the standing crop and species number of diatoms, water of Tokyo Bay was eutrophic in 1947 and extremely eutrophic in recent years. It may possibly become even polysaprobic, if the eutrophication and the pollution will be accelerated from now on.--Copyright 1975, Biological Abstracts, Inc.
W76-12268

QUANTITY OF HETEROTROPHIC BACTERIA ON SOME HIGHER PLANTS IN CARP PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
For primary bibliographic entry see Field 5B.
W76-12271

THE INFLUENCE OF GRASS-CARP POPULATION (CTENOPHARYNGODON IDELLA VAL.) ON THE VEGETATION AND ECOSYSTEM OF LAKE TRAKOSCAN, (IN SERBO-CROATIAN),
Zagreb Univ. (Yugoslavia). Institut za Biologijo.
M. Mestrov, L. Ilijanic, V. Tavcar, and J. Koprek.
Acta Bot Croat. 32, p 125-134, 1973.

Descriptors: *Dissolved oxygen, *Mud, Lakes, Europe, Organic matter, Sedimentation, Organic matter, *Carp, Respiration, Ecosystems, Microorganisms, Phytoplankton, Zooplankton.
Identifiers: Ctenopharyngodon-Idella, Grass Carp, *Lake Trakoscan(Yugoslavia).

The lake is choked by mud so that the mud content rises to 37% of total volume. The main cause of muddiness is an alluviation of deposited mineral material. Abundant macrovegetation supports the sedimentation of inorganic and organic matter and causes a rise of the bottom. A large quantity of anaerobic microorganisms in the mud made anaerobic respiration possible over a great part of the lake. Decline in the quantity of dissolved O2 was noted every summer. Characteristic of the lake is its betamezosaprobity especially toward the bottom (alphamezosaprobity). The radical decrease in macrovegetation in 1971 caused by the grass-carp, resulted in essential alteration of physicochemical features of the water as well as in quantitative and qualitative changes in the plankton community. The disappearance of the dominant kinds of macrovegetation caused the elimination of the main consumer of CO2, followed by vigorous augmentation of dissolved carbon dioxide. In 1971 particularly in Aug., a decline was noticed in the quantity of dissolved O2. Strong fluctuations in the quantitative composition of zoo- and phytoplankton in 1971 indicate a disordered balance in the ecosystem caused by the planted fish. Recovery will require the cleaning of the lake by removing the mud and the construction of a sedimentary storage pond. The planting of grass-carp or other kinds of fish should be done cautiously and its effect will have to be controlled.--Copyright 1975, Biological Abstracts, Inc.
W76-12272

CONTRIBUTION TO EPIZOOTOLOGY OF SCHISTOCEPHALUS PUNGITII (LIGULIDAE) IN THE MANYCH-GUDILO LAKE, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
A. I. Kafanov, and I. M. Yazykova.
Zool Zh. 50(10), p 1572-1574, 1971.

Descriptors: *Epizootology, Lakes, Public health, Hosts, Intermediate hosts, Animal parasites, Diseases, Pathology.
Identifiers: Gelochelidon-Nilotica, Larus-Argentatus-Cacchinnans, Ligulidae, *Schistocephalus-Pungitii, Sterna-Hirundo, *Lake Manych-Gudilo(USSR).

An epizootic focus of schistocephalosis induced by S. pungitii exists in the Manych-Gudilo Lake, USSR. D. salinus and P. platygaster are intermediate hosts and Sterna hirundo, Gelochelidon nilotica and Larus argentatus cacchinans are final hosts. Epizootic foci of schistocephalosis may be spreading widely in southern USSR.--Copyright 1975, Biological Abstracts, Inc.
W76-12273

DISCOVERY OF LIGULA INTESTINALIS (GOEZE 1782) GMELIN, 1790 IN LERMICHTHYS MUTIRADIATUS (MEEK) (PISCES: GOODEIDAE), (IN SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Biologia.
R. Lamothe-Argumedo, and A. Cruzreyes.
Rev Soc Mex Hist Nat. 33, p 99-106, 1972.

Descriptors: *Mexico, Freshwater fish, Marshes, *Fish diseases, *Pathology, Mortality, Larvae, Epizoology.
Identifiers: Goodeidae, *Lermichthys-Multiradiatus, *Ligula-Intestinalis, Pisces, Cestodes.

The larva of Ligula intestinalis reported from Mexico for the 2nd time was found in the celom of Lermichthys multiradiatus, a freshwater fish captured in the Lerma marshes, Mexico. Larval Ligulidae are pathogenic to fish, especially to those of this small species; for besides the expoliative action characteristic of the cestodes, they displace the fish's viscera, producing serious complications which result in death, and thus may cause epizootics of considerable economic importance.--Copyright 1975, Biological Abstracts, Inc.
W76-12274

ON ENVIRONMENTAL FACTORS OF EEL POOLS: I. CHEMISTRY OF THE WATER AND SOIL AND PLANKTON IN OCTOBER 1965 AND JULY 1966, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
J. Toi, T. Ito, and Y. Satomi.
Bull Freshwater Fish Res Lab Tokyo. 21(1), p 1-13, 1971.

Descriptors: *Eels, Water chemistry, Plankton, *Soil chemistry, Anabaena, *Nitrogen compounds, Oxygen, Scenedesmus, *Environmental effects, Ponds, *Phosphorus, Compounds, *Phytoplankton, Zooplankton.
Identifiers: Microcystis.

Chemical and biological studies of water and soil in eel pools showed that dry fodder did not severely influence ecological conditions at least immediately after feeding. Under feeding conditions pH values and O2 values decreased in the early morning. O2 content varied from 0 to several hundred percent oversaturation. Concentrations of organically dissolved N compounds varies widely throughout the day. Organically dissolved P compounds show no essential changes. In the early morning Eh7 values of the water are dependent on O2 saturation. In pools where phytoplankton died due to a lack of nutrient salts the predominant phytoplankton species are not stable. Both organic N and P compound content correlates well with heat loss. When acid pool soils are neutralized by addition of lime, the predominant zooplankton species change. The ratio of particulate N/P is greater in the Microcystis eel pools than in the Scendesmus pools. The content of N compounds is lower in the Anabaena pools than in the Microcystis pools.--Copyright 1975, Biological Abstracts, Inc.
W76-12275

THE EXTENT OF HAZARD AND THE HYGIENIC STANDARDIZATION OF ISOPHTHALONITRILE IN BODIES OF WATER, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR).

V. V. Gaidamaka.
Gig Sanit. 11, p 17-20, 1974.

Descriptors: *Public health, *Organoleptic properties, Rodents, Lethal limit, Toxicity, *Water quality standards, Water pollution effects, Digestion, *Nitrogen compounds.
Identifiers: Guinea-Pig, Rabbit, *Isophthalonitrile.

Based on the effects of isophthalonitrile on the organoleptic properties of water, the sanitary regimen of water bodies and on mice, rats, guinea pigs and rabbits, its maximal permissible concentration in water bodies should be 5 mg/1.--Copyright 1975, Biological Abstracts, Inc.
W76-12286

VERTICAL DISTRIBUTION, SESTONIC SEASONAL DYNAMICE AND THE ROLE OF DETRITUS IN THE LAKE DAL'NEYE ECOSYSTEM, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
E. B. Pavel'Eva.
Gidrobiol Zh. 10(3), p 20-24, 1974.

Descriptors: *Vertical distribution, *Seston, Lakes, Seasonal, Thermal stratification, Water temperature, *Detritus, Vegetation, Daphnia, Ecosystems.
Identifiers: Cyclops-Scutifer, Daphnia-Longiremis, Filinia, Neutrodiaptomus-Angustilobus, Stephanodiscus-Astraea, Organic carbon, Lake Dal'neye(USSR).

Vertical distribution of the seston components (including Stephanodiscus astrea, Cyclops scutifer, Daphnia longiremis, Neutrodiaptomus angustilobus and Filinia) in Lake Dal'neye (USSR) for the vegetation period is closely connected with the temperature stratification of the water body. Detritus comprises from 40-60% (at rest), to 90% of the organic suspension. The proportional season average values of DOS, detritus and living organisms correlate as 100:7:9. For the observation period the value of total organic C in the surface layer was equal to an average of 4.16 mg/l (to 2.5 mg/l).--Copyright 1975, Biological Abstracts, Inc.
W76-12301

SESTON OF THE KIEV WATER RESERVOIR AND QUANTITATIVE RATIOS OF ITS COMPONENTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. D. Primachenko, L. E. Mikhailenko, S. L. Gusynskaya, G. A. Enaki, and L. I. Pshenichnaya.
Gidrobiol Zh. 10(3), p 12-19, 1974.

Descriptors: *Seston, *Biomass, *Reservoirs, Water storage, *Diatoms, *Phytoplankton, Vegetation, Organic matter, Detritus, Bacteria, Algae, Plankton, Aquatic animals.
Identifiers: Ukrainian-SSR, *Kiev water storage reservoir(USSR).

Seston biomass of the Kiev water storage basin (Ukrainian SSR, USSR) varied from 20-56 g/m2, the average value being 37 g/m2 (in dry weight). Diatomeae dominated the phytoplankton for the vegetation period. Organic material prevailed over mineral material in the seston composition, accounting, on an average, for about 80% of the seston total weight; 73% of the organic part was composed of detritus (mainly of autochonous and planktonic origin); 27%, of plankton (18%, algae; 6%, bacteria; 3%, animals). The ratio of the plankton components (except Protozoa) expressed in energetic units was algae, 71%; bacteria, 19% and animals, 10%.--Copyright 1975, Biological Abstracts, Inc.
W76-12302

WINTER HYDROCHEMICAL CONDITIONS OF SMALL RIVERS IN THE POLESYE OF THE UKRAINIAN SSR (THE PRIPYAT BASIN), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. D. Konenko, I. G. Garasevich, and I. V. Grib.
Gidrobiol Zh. 10(3), p 5-11, 1974.

Descriptors: *Organic compounds, Rivers, Ions, Salts, *Gases, Odor, Industrial wastes, *Food processing industry, River basins, *Water chemistry, Winter.
Identifiers: *Sugar industry, Ukrainian-SSR(Pripyat basin), Polesye rivers(USSR).

The formation of ionic-salt compositions, the composition of biogenic and organic substances and of gaseous conditions of small Polesie rivers (USSR) in winter are considered in connection with natural and anthropogenic factors. Waste water of the food industry and sugar refineries have a considerable effect on the gaseous conditions and regime of organic substances in the rivers under study.--Copyright 1975, Biological Abstracts, Inc.
W76-12303

THE EFFECT OF DOMESTIC WASTE WATER ON THE DISTRIBUTION OF GAMMARUS PULEX L. AND GAMMARUS FOSSARUM KOCH IN A SUB-ALPINE MOUNTAIN STREAM IN HESSEN, (IN GERMAN),
Max-Planck-Institut Fuer Limnologie, Schlitz (West Germany). Limnologische Flussstation.
M. P. D. Meijering, A. G. L. Hagemann, and H. E. F. Schroeer.
Limnologica. 9(2), p 247-260, 1974.

Descriptors: *Domestic wastes, *Distribution, *Streams, Europe, Mortality, *Water temperature, Water purification, Seasonal, *Turbulence.
Identifiers: *Gammarus-fossarum, *Gammarus-pulex, *West German(E. Hessen).

The unpolluted streams of E Hessen (West Germany) are populated by G. fossarum along most of their length but G. pulex is concentrated mainly at the sources and lower courses due to temperature and turbulence. The slough system contained a small amount of G. pulex in a G. fossarum population which reached a maximum in autumn and almost disappeared in winter but never entirely. After purification of the water, only G. pulex reappeared in the lower course. When transferred to highly polluted water, G. pulex had the same pollution resistance in every season but its mortality rate was highest in heavily polluted water during summer. The same was true of G. fossarum but its populations diminished even faster.--Copyright 1975, Biological Abstracts, Inc.
W76-12304

DISTRIBUTION OF HETEROTROPHIC BACTERIA IN WATER AND BOTTOM DEPOSITS OF THE KREMENCHUG RESERVOIR IN RELATION TO THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN RUSSIAN),
Kiev State Univ. (USSR).
L. G. Brantsevich, and N. I. Sakharova.
Gidrobiol Zh. 10(6), p 62-65, 1974.

Descriptors: *Distribution, *Bacteria, Bottom sediments, *Reservoirs, *Cyanophyta, Algae, Path of pollutants.
Identifiers: *Heterotrophic bacteria, *Kremenchug Reservoir(USSR), Dnieper River(Ukranian SSR).

A study of the vertical, horizontal and seasonal distribution of microorganisms in the water column and bottom deposits of the Kremchug Reservoir on the Dnieper River (Ukrainian SSR, USSR) showed that the quantitative vertical distribution of bacteria and blue-green algae in the reservoir coincides. In the seasonal dynamics of heterotrophic bacteria, a summer-fall maximum is noted and for algae, a fall maximum. The number of algae and their physiological state affect the distribution of bacteria in the water and bottom deposits of the reservoir.--Copyright 1975, Biological Abstracts, Inc.
W76-12306

STUDIES OF MINERAL PHOSPHATE CONSUMPTION BY A TROPICAL WATER PLANKTONIC COMMUNITY, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
Yu. I. Sorokin, and D. E. Vyshkvartsev.
Okeanologiya. 14(4), p 688-692, 1974.

Descriptors: *Phosphates, Phytoplankton, Plankton, *Pacific Ocean, Tropics, *Absorption, Bacteria.
Identifiers: *Mineral phosphate.

The intensity of phosphate consumption by a planktonic (including phytoplankton) community of the tropical waters of the SW Pacific was analyzed with the aid of P32. The rates of phosphate consumption (per day) were: 0.4 micrograms P/l in the region of weak divergence, 0.1-0.3 micrograms P/l in the region of convergence and 1-2 micrograms P/l in the shallow waters. The turnover time of phosphate P in the surface waters was significant (100-200 h). In accordance with the size distribution of microplankton, a large part of phosphate is consumed by bacteria.--Copyright 1975, Biological Abstracts, Inc.
W76-12308

HYDROGRAPHY AND PHYTOPLANKTON FROM THE BAY OF CADIZ, FROM JANUARY OF 1970 TO DECEMBER OF 1973, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain). Laboratorio de Investigaciones Pesqueras.
For primary bibliographic entry see Field 5A.
W76-12309

FIRST DATA ON THE EXPERIMENTAL STUDY OF THE ZINC CYCLE IN THE LAGOON OF L'OLIVIER, (IN FRENCH),
Centre National de La Recherche Scientifique, Marseille (France). General Biology and Ecology Lab.
For primary bibliographic entry see Field 5A.
W76-12310

HYGIENIC EVALUATION OF CERTAIN SURFACE-ACTIVE SUBSTANCES, COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii i Mikrobiologii, Lvov (USSR).
For primary bibliographic entry see Field 5A.
W76-12314

HYGIENIC SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF HYDROGEN PEROXIDE IN SURFACE WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5A.
W76-12315

BACTERIOPLANKTON REPRODUCTION IN PHIALS WITH FILTERED WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Chita. Transbaik. Complex Expediton.
B. A. Shishkin, and A. A. Kalinina.
Gidrobiol Zh. 10(6), p 18-24, 1974.

Descriptors: *Bacteria, Lakes, Trophic level, *Filtration, *Absorption, Plankton, Reproduction, Water pollution.
Identifiers: *Bacterioplankton, Phials.

Experiments with filtered water from lakes of different trophic character showed that water filtration changes the habitat bacteria: regular change in their morphological composition and 'pulsation' of heterotrophic assimulation take place. The Razumov-Ivanov method for determining bacterioplankton generation times gives no indication of bacterial reproduction rates in the water body since in the filtered water this rate does not remain constant for a long time.--Copyright 1975, Biological Abstracts, Inc.
W76-12319

DESTRUCTION OF ORGANIC MATTER IN GROUNDS OF KAPCHAGAI RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
N. K. Gulaya, and N. L. Tyuten'kova.
Mikrobiologiya. 43(2), p 316-320, 1974.

Descriptors: *Organic matter, Reservoirs, Phytoplankton, *Decomposing organic matter, Aerobic conditions, Anaerobic conditions.
Identifiers: *Kapchagai Reservoir(USSR).

The rate of destruction of organic matter was determined in soils of the Kapchagai Reservoir (USSR) during the 3rd year of its filling (May, July and Oct. of 1972). Aerobic decomposition of organic matter per day was 329 mg C/m2 in spring, 280 mg C/m2 in summer and 206 mg C/m2 in autumn. Anaerobic destruction of organic matter per day was 38% in spring, 62% in summer and 48.8% in autumn, of the total amount of mineralized organic matter. (Phytoplankton are mentioned.)--Copyright 1975, Biological Abstracts, Inc.
W76-12320

THE MERCURY CONCENTRATION IN EELS (ANGUILLA ANGUILLA) FROM THE ESTUARY OF THE GUADALQUIVIR RIVER AND 'ESTEROS' OF SALINES OF CADIZ BAY, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Dadiz (Spain). Laboratorio de Investigaciones Pesqueras.
R. Establier.
Invest Pesq. 39(1), p 249-156, 1975.

Descriptors: *Mercury, *Eels, Estuaries, Europe, Bays, Rivers, Sediments, Salinity.
Identifiers: Anguilla-Anguilla, Esteros, Guadalquivir River(Spain), Mugil-Auratus, Mugil-Cephalus, *Bay of Cadiz(Spain).

The average concentration of total Hg (expressed on a wet weight basis) of eels from the estuary of the Guadalquivir River and from 'Esteros' of Salines from Cadiz Bay (Spain) was 0.27 ppm and 0.19 ppm, respectively. The levels of Hg in mullet (Mugil cephalus and M. aurata) were below 0.12 ppm. Concentration of Hg in sediment from Salines of Cadiz Bay was 0.12-0.18 ppm.--Copyright 1975, Biological Abstracts, Inc.
W76-12321

SOME ASPECTS OF FOAM AND SCUM MYCOFLORA IN THE RUNNING WATERS OF POLESYE AND STEPPE OF THE UKRAINIAN SSR, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
I. O. Dudka, and N. O. Moshkova.
Ukr Bot Zh. 31(6), p 723-727, 1974.

Descriptors: *Foaming, *Fungi, Rivers Streams, Forests.
Identifiers: *Polesye(USSR), Scum, Steppe, Ukrainian-SSR, *Micoflora, *Fungal spores.

Comparison between the complexes of fungal spores found in foam and scum of the running waters in Polesye and steppe of the Ukrainian SSR (USSR) and those found in the surface biotope of the running waters in forest-steppe and the Carpathians showed that the former differ in having less specific variety and fewer spores. The poorest specific composition and the fewest fungal spores are observed in the surface biotope of the steppe running waters. In the foam and scum of the steppe rivers and streams the spores of ground fungi were an essential quantitative component of the fungal complex, while in the surface biotope of the running waters in other botanicogeographical zones of the Ukrainian SSR the total quantitative content of the fungal spores was determined by the quantity of aquatic hyphomycetous conidia. The hydrological and hydrochemical factors affecting the formation of fungal spore complexes in neuston associations in the Polesye and steppe running waters are also discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-12323

STUDIES ON THE PRODUCTIVITY OF THE KALEN-GO-STREAM IN CENTRAL AFRICA, (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Institut.
K. Boettger.
Arch Hydrobiol. 75(1), p 1-31, 1975.

Descriptors: *Productivity, *Streams, Africa, *Aquatic insects, Water pollution effects.
Identifiers: *Zaire.

Productivity studies were performed on a mountain stream at the Institut pour la Recherche Scientifique en Afrique Central (Republic of Zaire). A tent made of plastic and gauze erected over the stream, covered an area of 8.90 m2. From daily collections of all insects emerging from the stream, emergence was determined. Work in the field lasted from April 1972-July 1973.--Copyright 1975, Biological Abstracts, Inc.
W76-12324

DEVELOPMENT OF CERTAIN BLACK SEA FISHES IN SEA CONTAMINATED BY PETROLEUM PRODUCTS,
O. G. Mironov.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 904T, $3.50 in paper copy, $3.00 in microfiche. EPA Translation EPA-TR-31-75. September 1974, 9 p, 2 tab, 3 fig, 4 ref. Source publication not given.

Descriptors: *Marine fish, *Fish physiology, *Fish eggs, *Oily water, *Toxicity, *Bioassay, *Reproduction, Fry, Water pollution effects, Oil pollution, Oil spills, Zooplankton, Growth rates, Growth stages.
Identifiers: Engraulis enrasicholus, Scorpaena porcus, Crenilabrus tinca, *Black Sea.

A study was made of the development of the fertilized eggs of Engraulis enrasicholus ponticus Alex., Scorpaena porcus L., and Crenilabrus tinca L. in sea water containing 0.1-0.01 ml/liter petroleum, solar oil, and mazut. The different species sensitivity of the fishes to the petroleum products used was found. The damaging effect of these compounds (death of the organisms) was clearly indicated down to a concentration of 0.001 ml/liter. Lower concentrations of petroleum, solar oil, and mazut were also proved toxic for the hydrocarbionts. The consequences of this intoxication can be reflected not in the direct death of the roe or prelarvae, but in the later stages of development or in future generations. (Katz)
W76-12326

EFFECTS OF A WASTE OF 'PAPER KRAFT' ON THE BENTHIC ALGAL POPULATIONS IN N.W. SPAIN. 'STRESS' ON THE FUCACEAE STANDING CROP, (IN SPANISH),
Instituto de Investigaciones Pesqueras, Vigo (Spain). Laboratorio de Investigaciones Pesqueras.
F. X. Niell, and Y. J. Buela.
Investigacion Pesquera, Vol 40, No 1, p 137-149, 1976. 5 fig, 2 tab, 6 ref.

Descriptors: Aquatic plants, *Benthic flora, *Kraft mill, *Lignins, *Mussels, Industrial wastes, *Water pollution effects, Pulp and paper industry, Kelps, Biomass, *Pulp wastes, Standing crops, Bays, Plant populations, Mollusks.
Identifiers: *Spain(Pontevedra Bay), Intertidal zonation, Mytilus, Fucus, Lignosulphonic residues.

Populations of intertidal fucaceae in the vicinity of a Kraft pulping waste discharge in Pontevedra Bay, Spain, show the effects of pollution. There is a total abiotic zone in the immediate vicinity of the discharge; farther on, a semi-biotic zone is found; and farther distant a zone with some eutrophic population characterized by an abundance of Mytilus and Ulvales. The biomass is lower near the discharge. There is a high negative correlation between lignosulphonic residues and biomass. (Katz)
W76-12327

A BIOENERGETICS-BASED MODEL FOR POLLUTANT ACCUMULATION BY FISH. SIMULATION OF PCB AND METHYL-MERCURY RESIDUE LEVELS IN OTTAWA RIVER YELLOW PERCH (PERCA FLAVESCENS),
National Research Council of Canada, Ottawa (Ontario). Div. of Biological Sciences.
R. J. Nortstrom, A. E. McKinnon, and A. S. W. deFreitas.
Journal of the Fisheries Research Board of Canada, Vol 33, p 248-267, 1976. 7 tab, 8 fig, 51 ref.

Descriptors: *Yellow perch, *Path of pollutants, *Growth rates, *Absorption, *Mathematical models, *Polychlorinated biphenyls, *Mercury, *Pesticide residues, *Pesticide kinetics, Metabolism, Fish physiology, Pesticides, Kinetics, Respiration, Seasonal, Temperature.
Identifiers: Perca flavescens, Bioenergetics, Bioaccumulation.

A pollutant accumulation model is developed which successfully predicts concentrations of PCB's and methylmercury in tissue of yellow perch (Perca flavescens). The model is based on pollutant biokinetics coupled to fish energetics. The expression for metabolic rate includes a growth dependent term for estimating the contribution to metabolism of seasonal and annual growth in each age-class. Pollutant clearance is related to body weight raised to the power of -.58, but is independent of metabolic rate. Under steady state conditions of chronic exposure, the predicted ratio of uptake to clearance is roughly constant at all weights, and the slope of a curve of log pollutant concentration in tissues vs. log body weight can be used to establish the exponent of body weight for clearance. (Katz)
W76-12329

DDT CAUSES CHANGES IN ACTIVITY AND SCHOOLING BEHAVIOR IN GOLDFISH,
New Jersey Coll. of Medicine and Dentistry, Newark. Dept. of Anatomy.
P. Weis, and J. S. Weis.
Environmental Research, Vol. 7, p 68-74, 1974. 1 fig, 2 tab, 25 ref.

Descriptors: *DDT, *Fish behavior, *Laboratory tests, *Water pollution effects, Schools(Fish), Social behavior(Animal), Pesticides, Metabolism, Analytical techniques, Behavior, Aquatic environment, Pesticides, Chlorinated hydrocarbon pesticides, Lethal limit.

Identifiers: *Sublethal effects, *Goldfish behavior.

Goldfish were exposed to one part per billion DDT in water for 7 days, then placed in clean water. After 3 days of exposure, groups of five showed significant increases in activity of individuals, school size and angular deviation. In response to a fright stimulus, treated schools scattered further and did not regroup as soon as did control schools. These effects were no longer evident 1 wk after fish were transferred to clean water. (Katz)
W76-12330

ACUTE EFECTS OF CADMIUM ON ICTALURUS PUNCTATUS (CATFISH),
Texas A and M Univ., College Station. Dept. of Veterinary Physiology and Pharmacology.
B. P. Smith, E. Hejtmanick, and B. J. Camp.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 3, p. 271-277, 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Bioassay, *Cadmium, *Absorption, Fish physiology, Laboratory tests, *Catfishes, Metals, Analytical techniques, Pollutant identification, Water pollution effects.
Identifiers: Bioaccumulation, Magnification, *Tissue analysis, *Hematology.

The uptake and tissue distribution of cadmium in catfish (Ictalurus punctatus) was studied following exposure of catfish to varying concentrations of cadmium and alterations in hematological constituents resulting from this exposure were examined. The cadmium concentrations found in the brain were in trace amounts and appeared to be independent of cadmium exposure. Liver and kidney accumulated cadmium with the amount of cadmium accumulated in the kidney increasing with increased cadmium exposure. The greatest biological magnification of cadmium in the liver and kidney occurred at the lowest cadmium exposure level (12 x and 41 x, respectively). Consequently, tissue levels of cadmium cannot be correlated with ambient cadmium levels. Exposure of catfish to cadmium did not produce signficiant differences in hematological constituents between control and test fish. (Katz)
W76-12331

AN ACUTE SEPTICAEMIC DISEASE OF BROWN TROUT (SALMO TRUTTA) AND ATLANTIC SALMON (SALMO SALAR) CAUSED BY A PASTEURELLA-LIKE ORGANISM,
Norges Veterinarhoegskole, Oslo.
T. Hastein, and G. L. Bullock.
Journal of Fish Biology, Vol. 8, No. 1, p. 23-26, 1976. 2 tab., 6 ref.

Descriptors: *Fish diseases, *Fishkill, *Bacteria, *Brown trout, *Atlantic Salmon, Fish physiology, Analytical techniques, Diseases, Animal pathology, Salmonids, Salmon, Trout, Mortality, Water pollution effects, Pollutant identification.
Identifiers: *Pasteurella, Septicaemic disease, Fish pathogens, Pathogen identification, *Norway.

Ulcerations of the skin associated with haemorrhagic petechiae of liver and kidneys, were the main signs of disease affecting salmon and brown trout in Norway. A death rate of 15-20 parts per hundred was estimated for the 5 month period of mid-March-August, although mortalities occurred throughout the year. Bacteriological examination, involving 36 isolates, suggested the causal organism to be a Pasteurella although the DNA homology examination gave a G.C. ratio of 55.6 parts per hundred which is high for Pasteurella as a group. (Katz)
W76-12332

EFFECTS OF COPPER ON SURVIVAL AND OSMOREGULATION IN MARINE AND BRACKISH WATER ISOPODS (CRUSTACEA),
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
M. B. Jones.
In: Proceedings 9th European Marine Biology Symposium, H. Barnes, ed., Aberdeen University Press, p. 419-432, 1975. 6 fig., 55 ref.

Descriptors: *Copper, *Salinity, Stress, *Mortality, Environmental effects, *Lethal limit, Brackish water, *Crustaceans, *Isopods, Sea water, *Toxicity, *Bioassay, Osmosis, Invertebrates, Metals, Water pollution effects, Laboratory tests, Animal physiology.
Identifiers: Sublethal effects, Synergistic effects, *Osmoregulation.

A concentration of 10 mg/l copper was highly toxic to marine and brackish water isopods at salinities ranging from 100-1 parts per hundred sea water; each species had over 50 parts per hundred mortality even at optimum conditions of salinity at the LT50 values decreased with decreased salinity. Mortality did not reach 50 parts per hundred in full sea water with 1 mg/l copper, but a decrease in salinity caused an increase in the toxicity of the metal and shortened the LT50 times. In the absence of copper, the marine species were able to survive in salinities from 100 parts per hundred to 40 parts per hundred sea water, and the brackish water forms from 100 parts per hundred to 1 parts per hundred sea water, by maintaining their haemolymph osmotic concentration above that of the outside sea water. 1 mg/l copper caused a significant lowering of this osmotic pressure, particularly in dilute salt solutions. This suggests that copper acts synergistically with salinity, and concentrations of copper that are sub-lethal at optimum conditions become increasingly toxic as environmental stress is increased. (Katz)
W76-12333

ACUTE TOXICITY OF PHOS-CHECK (TRADE NAME) 202 AND DIAMMONIUM PHOSPHATE TO FATHEAD MINNOWS,
Environmental Health Lab., Kelley AFB, Tex.
R. C. Inman.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A006 122, $4.00 in paper copy, $3.00 in microfiche. Report EHL(K)74-31, December, 1974. 3 tab., 1 fig., 13 ref.

Descriptors: *Toxicity, *Bioassay, Freshwater fish, *Ammonium compounds, Analytical technique, *Minnows, *Phosphates, Laboratory animals, Water analysis, Hydrogen ion concentration, Water pollution effects, *Pollutant identification.
Identifiers: *Fathead minnows, Static bioassay, Phos-Check 202, Di-ammonium phosphate, *Fire-retardants, Dynamic bioassay, 96 hr LC50.

Fathead minnows were exposed to diammonium phosphate (DAP) and PHOS-CHECK (Trade Name) 202 (PC202) during static and dynamic bioassays. In static bioassays the 96 hour LC50 of DAP was 155 mg/l. The 96 hour LC50 of PC202 was 1320 microliters of the fire-retardant slurry per liter. The DAP concentration in the PC202 slurry would have been 150 mg/l at the 96 hour LC50 concentration. The incipient LC50 based on dynamic bioassays was 1022 microliters slurry per liter. Based on EPA recommendations of unionized ammonia not exceeding 0.02 mg/l, the recommended limit for PC202 was 66 microliters slurry or 3 mg DAP per liter at pH 7.8. At higher pH values the DAP or PC202 recommended concentrations would be even lower. (Katz)
W76-12334

A REVIEW OF LITERATURE ON THE USE OF POTASSIUM PERMANGANATE (KMN04) IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
T. O. Duncan.
Report FWS-LR-74-14, March, 1974. 61 p., 4 tab., 154 ref.

Descriptors: *Toxicity, Freshwater fish, *Bioassay, *Fish diseases, Fish establishment, Fish farming, Fish handling facilities, *Fish hatcheries, *Fish parasites, *Aquaculture, *Reviews, *Bibliographies, Potassium compounds, Aquaria, Fish eggs, Fish sterilants, Parasitism, Algicide, Fungicide, Fisheries.
Identifiers: *Potassium permanganate, Literature reviews.

Potassium permanganate is one of the most widely used inorganic chemicals in the world. Since its first use in fish culture in 1893, potassium permanganate has been used: primarily as a disinfectant in fish hatcheries, aquaria, raceways, ponds, and water supplies; for removal of fish parasites; to reduce disease, or as a disease preventative, especially on wounds of fish; for detoxification of fish toxicants such as rotenone and antimycin; for fungus and algae control; and temporary oxygen depletion problems in ponds. In foreign countries, potassium permanganate is used for removal of parasites before the live fish is sent to market, as well as a disinfectant. Complete review of literature concerning potassium permanganate's use in fisheries is presented. (Katz)
W76-12335

QUALITY OF POTATOES GROWN ON FIELDS IRRIGATED WITH WASTEWATERS OF COAL-TAR CHEMICAL AND METALLURGICAL PLANTS, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. A. Stempkovskaya, L. R. Polishchuk, and N. M. Barabanova.
Gig Sanit. 11, p 97-98, 1974.

Descriptors: *Potatoes, *Soil disposal fields, Irrigation practices, Chemical wastes, *Industrial wastes, Organic wastes, Nitrites, Ammonia, Chlorides, Microbial degradation, Sulfides, Water reuse.
Identifiers: Cyanides, Cyanates, Thiocyanates.

Potatoes grown on experimental plots irrigated with wastewaters from coal-tar chemical and metallurgical plants which contained large amounts of organic and inorganic chemicals were studied. Nitrites, thiocyanates, ammonia and chlorides accumulated in the potatoes during growth on the plots. All organic ingredients, cyanides and sulfides of the wastewaters were absent in the potatoes. The absence of these substances can be explained by their breakdown in the soil and in the plant itself under the effect of various factors (microbiological, physicochemical, etc.)--Copyright 1975, Biological Abstracts, Inc.
W76-12355

WATER QUALITY AND WASTE DISPOSAL IN MONTANA,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
J. W. Jutila.
Montana Agriculture - Focus on Improving the Environment, December 3-4, 1970, p. 61-68. 1 fig, 2 tab.

Descriptors: *Water quality, *Waste disposal, *Montana, *Water pollution sources, *Eutrophication, *Nitrates, *Phosphates, *Water pollution effects, Detergents, *Farm wastes.

Many Montana rivers and streams are being polluted with human and agricultural wastes, even at their headwaters, to the extent that the quality of

water of the Missouri River along its entire length may be seriously compromised. Surface waters are becoming so fertilized by man's activities that objectionable growths of water flora appear in abundance. In 1957, several teams of investigators from the Montana State University investigated the nature of the pollution problem in the East Gallatin River and its tributaries. Phosphates and nitrates, coming from sanitary sewer systems, synthetic detergents, burial of solid wastes, and excreta of farm animals were the primary factors causing undesirable water changes. Federal and state agencies have sponsored studies on the problem and solution of agricultural and human waste disposal pollution, emphasizing water quality studies. But far more research is required on the identity, fate, and biological and non-biological transformation of these pollutants. (Hisle-East Central)
W76-12359

HYGIENIC EVALUATION OF POTATOES GROWN IN SOIL IRRIGATED WITH EFFLUENTS FROM COKING AND CHEMICAL PLANTS OF THE DONETS COAL BASIN, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
N. M. Vorob'eva, S. G. Vasiliu, and L. T. Lukashevich.
Vopr Pitan. 4, p 49-53, 1974.

Descriptors: *Potatoes, Effluents, *Industrial wastes, Rodents, *Soil disposal fields, Soil disposal fields, Irrigation practices, *Chemical wastes, Public health, Water pollution effects, *Water reuse.
Identifiers: *Donets Coal basin(USSR), *Coal processing wastes.

Experiments with albino rats on the influence of protracted feeding (8 mo.) of potatoes from plots irrigated with effluents from coking and chemical plants of the Donets coal basin (Voroshilovograd region) (USSR) revealed some functional disorders in the liver and reduced weight gain. The chemical composition of potatoes grown on plots irrigated with undiluted effluents differed somewhat from control samples.--Copyright 1975, Biological Abstracts, Inc.
W76-12369

COMPARISON OF ECOLOGICAL IMPACTS OF POSTULATED OIL SPILLS AT SELECTED ALASKAN LOCATIONS. VOLUME I. INTRODUCTION, SUMMARY, METHODOLOGY, EVALUATION AND APPENDICES,
Mathematical Sciences Northwest, Inc., Bellevue, Wash.
J. S. Isakson, J. M. Storie, J. Vagners, G. A. Erickson, and J. F. Kruger.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 600, $16.25 in paper copy, $3.00 in microfiche. U.S. Coast Guard Final Report No. USCG-D-155-75, June 1975. 614 p, 5 append. DOT-CG-42913-A.

Descriptors: *Continental Shelf, *Alaska, *Environmental effects, *Water pollution effects, *Oil spills, *Oil pollution, Resources development, *Weathering, Treatment, Water resources, Marine animals, Marine plants, Invertebrates, Fish, Vegetation, Dispersion, Marine fish.
Identifiers: *Outer Continental Shelf, *Ecological impact, *Environmental impact, Containment.

A ranking of potential environmental impact for spills of crude oil, diesel-2, bunker C, and gasoline in amounts ranging from 100 to 50,000 barrels was made for specific sites at Yakutat Bay, Valdez Harbor, Valdez Narrows, Drift River Channel, Port Graham, Kamishak Bay, Unimak Pass, Port Noller, Kvichak Bay, St. Matthew Island, Offshore Prudhoe, Onshore Prudhoe, Nome, Cape Blossom Channel, Colville River, Yukon River, and Denali Fault. Spills were assumed to disperse from inertial, viscous, surface tension, wind and current forces. Most probable wind and current conditions were utilized. Sites were characterized in terms of eight species habitats. Most probable cases were evaluated. A rating system was devised to characterize the impact based upon estimated species abundance, importance of species, and the impact of oil on such species over the short and long term. Impacts were estimated with the use of three-dimensional matrices. The highest impact ratings were obtained for spills at Port Graham, Valdez Narrows, Unimak Pass, and the Yukon River Crossing, assuming no spill cleanup. The same five locations dominated the impact rating where containment/cleanup were assumed to take place. Data gaps were noted and future studies are recommended. (Sinha-OEIS)
W76-12379

TOXIC EFFECTS OF OIL DISCHARGED FROM SHIPS,
Exxon Research and Engineering Co., Linden, N.J. Government Research Labs.
J. W. Frankenfeld, J. J. Elliott, R. E. Bentley, and B. H. Sleight, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-022 902, $6.00 in paper copy, $3.00 in microfiche. U.S. Coast Guard Final Report No. USCG-D-16-75, December 1975. 138 p, 22 fig, 48 tab, 55 ref, 2 append. DOT-CG-51073-A.

Descriptors: *Water pollution effects, *Environmental effects, *Oil spills, *Oil pollution, *Toxicity, Fish, Shellfish, *Water pollution effects, Freshwater fish, Sea water, Shrimp, Minnows, Continental Shelf.
Identifiers: *Outer Continental Shelf, Biological effects, Fathead minnows, Mimmichog.

A study was conducted to determine the portions of six petroleum products which are dispersed and dissolved in water under specified conditions and the toxic effects of both the dissolved and the dispersed-plus-dissolved fractions on selected test organisms. The oils employed included: a Kuwait and a West Texas Crude, a marine diesel fuel, Navy Distillate and Navy Special fuel oils and a 9250 lubricating oil. The test organisms employed were the fathead minnow (Pimephales promelas), mimmichog (Fundulus heteroclitus) and the brine shrimp (Artemia salina). The effects of time, temperature and salinity were investigated. In addition, the maximum solubility of each test oil in fresh water was determined by means of partitioning conditions. Two types of analytical methods, total organic carbon determinations (TOC) and an extraction-infrared procedure were employed. Maximum observed solubilities in fresh water ranged from 3.1 ppm for the 9250 lube oil to 35 ppm for the light Kuwait crude. Solubilities in salt water were lower than fresh water by a factor of 2-4 while reducing the temperature from 77F to 57F had a lesser effect. Most fresh water dispersions settled rapidly for 48 hours and then reach near equilibrium; salt water and cold temperature dispersions settled faster. (Sinha-OEIS)
W76-12380

FIRST STUDIES ON THE ZOOPLANKTON OF THE LOTIC WATERS OF THE MIDDLE PARANA RIVER BASIN, (IN SPANISH),
J. C. Paggi, and S. J. Depaggi.
Physis Secc B Aguas Cont Org. 33(86), p 91-114, 1974.

Descriptors: *Zooplankton, *Lotic environment, *South America, River basins, Ecology, Salinity, Water temperature, Hydrogen ion concentration, Copepods, Turbidity, Crusteoceans.
Identifiers: *Parana River basin(Argentina).

The information obtained in an early stage of a series of investigations about the ecology of zooplankton in the Middle Parana River (Argentina) is analyzed. The objective was to study the community structure and evolution of zooplankton for 17 mo. and to estimate the relative importance of some environmental parameters in this process. Three places were sampled monthly between the cities of Parana and Santa Fe. Total salinity, pH, temperature, turbidity and hydrological regime were studied. The community contains 90 spp. made up of Rotatoria, Copepoda and Cladocera, being almost all true planktonic species while littoral and benthic ones are scarce. The communitary structure is very similar to that of regional lenitic bodies of water, although the diversity of Copepoda is somewhat less. Some species not recorded in regional lenitic waters are found in these rivers. The environmental parameters showing the highest correlation to the quantitative fluctuations of zooplankton are turbidity and hydrological regime, principally the former.--Copyright 1975, Biological Abstracts, Inc.
W76-12382

THE PASSAGE OF TRITIUM WITH DRINKING WATER INTO THE BODY OF RATS AND THEIR PROGENY IN A CHRONIC EXPERIMENT, (IN RUSSIAN),
Y. I. Moskalev, A. M. Lyaginskaya, and A. G. Istomina.
Gig Sanit. 11, p 35-37, 1974.

Descriptors: *Tritium, *Potable water, Rodents, *Digestion, Absorption, Toxicity, Water pollution effects.
Identifiers: Tritium oxide.

The kinetics of 3H accumulation in the body of rats (male and female), pregnant rats and rattlings during the chronic entry of tritium oxide with the drinking water was studied. When mixed feedstuffs were given, the 3H contents in the water phase of the body of adult rats amounted to 42-44% of its concentration in the drinking water, in the water phase of rattlings on the 3rd-15th day, it equaled 28%. No placental barrier existed for tritium oxide in the body of pregnant rats.--Copyright 1975, Biological Abstracts, Inc.
W76-12392

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W76-12415

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN - SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
For primary bibliographic entry see Field 5G.
W76-12444

AN HISTORICAL PERSPECTIVE OF NUTRIENT INPUTS AND TROPHIC STATES AS DEDUCED FROM CAYUGA LAKE SEDIMENTS,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
R. T. Oglesby, and J. Z. McKenna.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 843, $3.50 in paper copy, $3.00 in microfiche. Cornell University Center for Environmental Research Technical Completion Report, September, 1976, 15 p., 5 fig, 2 tab., 30 ref. OWRT A-054-NY(1), 14-31-0001-5032.

Descriptors: Stratigraphy, Clays, Absorption, *Nutrients, History, Pigments, Chlorophyll, Biodegradation, Paleolimnology, Lakes, *Phosphorus, Sediments, *Lake sediments, *New York, *Bottom sediments, *Trophic level, Organic matter, Primary productivity, Cores, Sampling, *Profundal zone.
Identifiers: *Cayuga Lake(NY).

Bottom cores were collected from the profundal zone of Cayuga Lake and stratigraphically analyzed for phosphorus, organic and pigment contents; and a geological time scale for their deposition was determined. Precultural sediments were characterized by high variability of most parameters. Those deposited since the mid 19th century had properties consistent with the hypothesis that cultural influences have produced a marked increase in primary productivity, especially during the past several decades. Evidence was also obtained supporting the postulate that phosphorus absorbed to clay particles is of limited availability to phytoplankton. For postcultural sediments variations in P content and chlorophyll degradation products or organic matter were inversely related.
W76-12463

IMPACT OF A MAINSTREAM IMPOUNDMENT ON THE FISH FAUNA OF BIG WALNUT CREEK A SCIOTO RIVER TRIBUTARY IN CENTRAL OHIO,
Ohio State Univ., Columbus. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W76-12465

MICROBIOLOGICAL TRANSFORMATION OF CARBON NITROGEN, SULFUR, IRON, PHOSPHORUS AND CALCIUM COMPOUNDS IN LAKE RESERVOIRS, (IN POLISH),
Polish Association of Sanitary Engineering and Technology, Warsaw.
S. Niewolak.
Gaz Woda Tech Sanit. 47(2), p 39-42, 1973.

Descriptors: Microbiology, Carbon, *Nitrogen, Sulfur, Iron, *Phosphorus, Calcium compounds, Waste disposal, Lakes, Water pollution effects, *Cycling nutrients, *Productivity, *Sewage disposal, Cycles, Photosynthesis, Phytoplankton.

Disposal of agricultural, communal and industrial sewage into lakes can result in far reaching changes leading to atrophy of the water body. Reactions differ in different types of lakes. Two contrasting processes can be distinguished in the C cycle, synthesis of organic substance from CO2 and mineral compounds and mineralization or destruction. The N cycle is closely linked with production of organic substances in the phytoplankton photosynthesis process. The P cycle is closely linked with the Fe and S cycles. Each of these cycles is presented in graphic form and explained. Productivity of lakes is greatly influenced by the transformations.--Copyright 1975, Biological Abstracts, Inc.
W76-12494

ENDEMIC FLUOROSIS IN PUNJAB: I. SKELETAL ASPECT,
Government Medical Coll., Patiala (India). Dept. of Medicine.
S. S. Jolly, S. Prasad, R. Sharma, and R. Chander.
Fluoride. 6(1), 4-18. 1973.

Descriptors: Asia, X-ray analysis, Surveys, *Public health, *Human diseases, *Fluorides, *Fluoridation.
Identifiers: *Endemic fluorosis, *Punjab(India).

In extensive surveys of 10 villages from a known hyperendemic fluorosis area of Punjab (India), namely the Bhatinda and Sangrur Districts, an effort was made to examine each individual and to take X-rays on as many as possible. A very high incidence of dental (44-81%) and skeletal (2.8-81%) fluorosis was observed but no strict correlation between the 2 manifestations could be established. Crippling and neurological fluorosis occurred much more frequently in men than in women. The chief factors determining fluoride toxicity were the fluoride concentration in drinking water and the duration of exposure to this hazard. Yet in spite of identical concentrations of fluoride in water, variations in the incidence of the disease occurred. They were related to other chemical constituents of drinking water which are protective against the development of fluorosis such as Mg, Ca and total hardness. Physical stress which was chiefly responsible for the severity of disease in men was also responsible for the neurological complication. Mal-nutrition played no etiological role in this disease. Food grown in the fluorotic soil did not provide a significant quantity of fluoride.--Copyright 1973, Biological Abstracts, Inc.
W76-12500

PHOSPHATE RELEASE AND SORPTION BY LAKE MOHEGAN SEDIMENTS,
City Coll., New York. Dept. of Civil Engineering.
J. Fillos, and H. Biswas.
Journal of the Environmental Engineering Division, Proceedings of the Society of Civil Engineers, Vol. 102, No. EE2, p 239-249, April 1976.

Descriptors: *Environmental engineering, *Eutrophication, *Lakes, *Phosphorus, *Sediments, Lake basins, Water management(Applied), Water quality, Sorption, Aerobic conditions, Anaerobic conditions, Water pollution effects.

The release rate of phosphorus from lake sediments to the overlying water was measured in a laboratory experiment. The sediments were from Lake Mohegan, a eutrophic lake in northern Westchester County, New York. The sorption capacity for phosphorus of Lake Mohegan sediments depends on the oxygen concentration in the overlying water. When the phosphate concentration in the overlying water is high, above 1-2 mg/1, the sediments will sorb phosphorus from the overlying water under both aerobic and anaerobic conditions. Below this phosphate value, the sediments will release phosphorus under anaerobic conditions while they will sorb phosphorus under aerobic conditions. (Bell-Cornell)
W76-12512

A EUTROPHICATION MODEL FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology) Vol. 2, No. 2, p 147-165, June 1976. 9 fig, 11 tab, 22 ref.

Descriptors: *Ecosystems, *Lakes, *Mathematical models, *Eutrophication, *Waer quality, Phytoplankton, Kinetics, Biomass, Waste water treatment, Equations, Systems analysis, Simulation analysis, Forecasting, *Model studies, Path of pollutants.

Different lake models were tested against measured values. It was found that a model based upon phytoplankton population dynamics gave a better description than a model based upon Monod's kinetics. The calibration of the model showed that it was necessary to use a recently developed submodel for sediment-water nutrient exchange. Furthermore, the work showed that it was essential to include in the model three trophic levels, denitrification, a time dependent nitrogen input and Steele's expression for the grazing rate. A prediction for different waste water treatment alternatives was worked out. (Bell-Cornell)
W76-12515

LARGE SCALE SYSTEMS APPROACH TO ESTUARINE WATER QUALITY MODELLING WITH MULTIPLE CONSTITUENTS,
Texas Univ. at Austin. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 5B.
W76-12517

AN INTERDISCIPLINARY MATHEMATICAL MODEL APPLIED TO THE SOUTHERN BIGHT OF THE NORTH SEA,
Liege Univ. (Belgium). Institut de Mathematique.
For primary bibliographic entry see Field 5B.
W76-12518

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
D. Scavia, and R. A. Park.
Ecological Modelling, (International Journal on Ecological Modelling and Engineering and Systems Ecology), Vol. 2, No. 1, p 33-58, March 1976. 10 fig, 6 tab, 58 ref.

Descriptors: *Aquatic environment, *Model studies, *Simulation analysis, *Zooplankton, *Phytoplankton, Phosphorus, Nitrogen, Behavior, Temperature, Biomass, Nutrients, *Lakes, Systems analysis, *New York.
Identifiers: Consumption, Food, Process rates, Population-age structure, *Lake George(NY).

Process representations critical to the phytoplankton and zooplankton submodels are described. These include constructs for: light- and nutrient-limitations and their interaction, temperature, consumption, and population-age structure. Values for key parameters are documented with reference to the literature on aquatic ecology and ecological modelling. Time-course relationships of the processes affecting the phytoplankton, zooplankton, phosphorus and nitrogen compartments are presented and discussed. These serve as additional documentation and are an important result of modelling synthesis. (Bell-Cornell)
W76-12519

ON THE POLLUTION OF WATER OF SOME RIVERS IN THE KASUMIGAURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W76-12568

GROWTH AND DISSIPATION OF PHYTOPLANKTON IN CHESAPEAKE BAY: I. RESPONSE TO A LARGE PULSE OF RAINFALL,
Johns Hopkins Univ., Baltimore, ,Md. McCollum-Pratt Inst.
M. E. Loftus, D. V. Subba Rao, and H. H. Seliger.
Chesapeake Sci. 13(4), p 282-299, 1972.

Descriptors: *Phytoplankton, *Chesapeake Bay, *Rainfall, Sampling, *Fluorescence, *Eutrophication, Nutrients, Bays, Dinoflagellates, Methodology, *Plant growth, Dissipation, Pollutant identification.

Approximately 90 km2 of Chesapeake Bay contiguous with the Severn, South, Rhode and West Rivers were surveyed by in vivo chlorophyll fluorescence and captured samples following a large pulse of rainfall in summer, 1971. The growth and subsequent dissipation of blooms containing chlorophyll a concentrations up to 40 X pre-bloom values were completed within 21 days. A distinction is made between the blooms produced by nutrient pulses and dinoflagellate blooms normally observed in the fall. In the former, these is a complete change of phytoplankton relative species composition. The latter is a phototactic segregation of species already existing within the water column. The methodology is presented and a mathematical description is attempted.--Copyright 1973, Biological Abstracts, Inc.
W76-12572

SCHISTOSOMIASIS AND OTHER HUMAN PARASITOSES OF LAKE LINDU IN CENTRAL SULAWESI (CELEBES), INDONESIA,
M. D. Clarke, W. P. Carney, J. H. Cross, P. Hadidjaja, and S. Oemijati.
Am J Trop Med Hyg. 23(3), p 385-392, 1974.

Descriptors: *Animal parasites, *Human diseases, Asia, *Parasitism, Lake basins, Water pollution effects.
Identifiers: Ascaris-Lumbricoides, Brugia-Malayi, Celebes, Chilomastix-Mesnili, Echinostoma-Lindoense, Endolimax-Nana, Entamoeba-Coli, Entamoeba-Hartmanni, Entamoeba-Histolytica, Enterobius-Vermicularis, Giardia-Lamblia, Hymenolepis-Diminuta, Iodamoeba-Butschlii, Necator-Americanus, Plasmodium-Falciparum, Plasmodium-Vivax, Schistosoma-Japonicum, *Schistosomiasis, Strongyloides-Sterscoralis, Sulawesi, Trichuris-Trichiura, *Lake Lindu(Indonesia).

The isolated Lake Lindu Valley of Central Sulawesi is the only reported Indonesian focus of oriental schistosomiasis. In April 1972, a parasitological survey involving over 1400 people was conducted in the valley's 4 villages. Schistosoma japonicum infections were detected in 37.9% of all Lindu people by direct and formalin-ether concentration examinations of stools: 57.1% in Anca, 42.4% in Tomado, 30.0% in Langko, and 11.7% in Puroo. Peak prevalences of schistosomiasis were reached in the 2nd decade of life and remained high thereafter among both male and female populations. Prevalence of other helminthic parasites are reported as follows: Hymenolepsis diminuta, <0.1%; Strongyloides stercoralis, 0.2%; Enterobius vermicularis, 0.8%; Trichuris trichiura, 8.8%; Ascaris lumbricoides, 15.2%; and hookworm (Necator americanus), 69.6%. No Echinostoma lindoense infection was detected. Intestinal protozoa including Entamoeba coli, Giardia lamblia, Endolimax nana, Entamoeba histolytica, Iodamoeba butschlii, Entamoeba hartmanni and Chilomastix mesnili were also encountered. In blood smears collected from 1348 people, Brugia malayi microfilariae were detected in 5.4% of the population, and Plasmodium vivax and Plasmodium falciparum in 2.5%. Filariasis was more frequent in older age groups, while most malaria infections were found in Lindu residents 10 yr old or younger.--Copyright 1974, Biological Abstracts, Inc.
W76-12573

HYDROCARBON RESIDUES IN IVORY COAST WATERS,
D. Binet, and E. Marchal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 797-T, $3.50 in paper copy, $3.00 in microfiche. Report EPA-TR 69-75, August 1974, 9 p. 4 tab. (Translation).

Descriptors: *Coastal areas, *Benthos, *Atlantic oil, *Oil pollution, *Oily wastes, *Waste water disposal, International waters, *Marine fish, Commercial fish, *Fish eggs, *Fish reproduction, *Fish harvest, Fisheries, *Organic compounds.
Identifiers: *Pelagic fish, *Tar globs, *Sardinella, Sardines, *Ivory coast waters, Stomach analysis, Fishery decline.

For some years, the beaches of Ivory Coast have become more and more polluted by hydrocarbon residues. In addition, plankton net hauls have shown that the quantities of hydrocarbons in suspension in sea water are far from being negligible and generally more important in shallow water near the coast. The presence of oil in the stomachs of pelagic fish and the scarcity of eggs and larvae of these fish suggest the hypothesis that the decrease in the yield of these fish in Ivory Coast waters may at least partially be due to this oil. The authors suggest that strong action should be taken in order to force oil tankers to respect international rules concerning tank cleaning (at a minimum distance of 100 miles offshore) until better cleaning methods are employed. (Katz)
W76-12579

THE EUTROPHICATION OF TITI LAKE AND ITS CONSEQUENCES FOR THE POPULATION OF DYNAMICS OF ZOOPLANKTON: 2, (IN GERMAN),
Universidad Austral de Chile, Valdivia. Instituto Zoologio.
E. Szymanski-Bucarey.
Arch Hydrobiol Suppl. 47(2), p 167-238, 1974.

Descriptors: *Eutrophication, Europe, Lakes, *Zooplankton, *Sewage, *Nitrates, *Phosphorus, Nutrients, Silica, Diatoms, Anabaena, Phytoplankton, Rotifers.
Identifiers: Asterionella-Formosa, Cyclops-Abyssorum, Diaphanosoma, Fragilaria-Cortonensis, Leptodora-Kindtii, Mixodiaptomus-Laciniatus, *Titi Lake(West Germany).

Lake Titi, a moraine-dammed lake in the upper Black Forest of (West) Germany, is naturally oligo-dystrophic but is now eutrophic, owing to sewage input. Observations were made between May, 1968-Nov., 1970, during a critical transition in the eutrophication of the lake. The inflow from the brook stratifies in the lakes from June until Nov. In late autumn it provides O2 to the deep hypolimnion before the full circulation sets in. The annual cycle of concentrations of various chemical components in the brook is due to variations of the water supply and in the amount of sewage. Alkalinity, pH, Ca, Mn and silicate concentrations were all approximately the same as reported in earlier works. Nitrate concentration, however, had doubled, and phosphate levels were 10 times greater than before. The elevated nutrient levels were due to the sewage. Silicate uptake by diatoms has practically doubled in comparison to earlier readings. In 1969, Asterionella formosa was the dominant form of phytoplankton. In 1964 Asterionella was evident in quantity only during spring and fall. In 1970 an extreme growth of Fragilaria cortonensis (July-Aug.) was followed by a bloom of Anabaena (Sept.-Oct.). The population curves of the most important species of planktonic rotifers, Cladocera and Copepoda were followed for 3 yr (1968-70). Leptodora kindtii appeared in the Titisee in 1969. The Diaphanasoma population had strongly decreased since eutrophication set in. The population dynamics of Mixodiaptomus laciniatus and Cyclops abyssorum were analysed. (See also W76-07281)--Copyright 1975, Biological Abstracts, Inc.
W76-12594

METABOLIC RATES OF ARCTIC LAKES,
Atlantic Biological Station, St. Andrews (New Brunswick).
H. E. Welch.
Limnol Oceanogr. 19(1), p 65-73, 1974.

Descriptors: *Arctic, *Canada, Lakes, *Respiration, Winter, Turbidity, Drainage basins, *Productivity, Analytical techniques, *Metabolism, Fjord.
Identifiers: Cornwallis Island(Canada), Plant cover, *Arctic lakes, Disko Fjord(Greenland).

A technique for calculating the respiration rates of arctic lakes during winter is presented. Respiration rates range from a low of 30 g O2 m-2 yr-1 at Resolute, Cornwallis Island (Canada), to over 200 at Disko Fjord, Greenland, but a general range of 40-70 can be expected at 75 N latitude. Differences in lake productivity are tentatively ascribed to variations in turbidity and plant cover in the drainage basin.--Copyright 1974, Biological Abstracts, Inc.
W76-12602

HARMLESSNESS OF GRAIN GROWN ON SEWAGE FARMS, (IN RUSSIAN),
Rostov-na-Donu Gosudarstvenni Meditisinskii Institut (USSR)
Y. G. Novoderzhkina, T. V. Kigel, and E. V. Makarenko.
Vopr Pitan. 2, p 86-88, 1974.

Descriptors: *Sewage, *Wheat, Irrigation, Rodents, Effluents, Laboratory animals, Chemical wastes, Industrial wastes.

Experiments lasting 1 1/2 yr were conducted on rats and rabbits to study the effect of wheat grain grown on sewage farms irrigated with conditionally pure sewage containing Ca, Mg, Na, K, sulfates, chlorides, toluene, petroleum products, caprolactam and formaldehyde from a chemical plant. The general health of the animals, condition of the hair, motor activity, change of body weight and relative weight of organs, rectal temperature, enzyme spectrum of the blood and liver tissue, protein and carbohydrate metabolism and pigment-producing function of the liver were determined. Feeding grain grown on sewage farms apparently does not cause any changes in laboratory animals.--Copyright 1975, Biological Abstracts, Inc.
W76-12645

5D. Waste Treatment Processes

ENVIRONMENTAL FACTORS INFLUENCING ISOLATION OF ENTEROVIRUSES FROM POLLUTED SURFACE WATERS,
New Hampshire Univ., Durham. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-12171

TIME PARAMETER EVALUATION IN DUAL FLOCCULANT DESTABILIZATION,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
B. F. Duff, and W. A. Barkley.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 736, $5.50 in paper copy, $3.00 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, WRRI Report No. 062, March 1976, 89 p., 34 fig., 9 tab., 34 ref. append. OWRT A-047-NMEX (2).

Descriptors: *Flocculation, *Waste Water Treatment, *Chemical precipitation, Colloids, Solid wastes, Zeta potential, Turbidity, Polyelectrolytes.
Identifiers: Latex, Aluminum sulfate, Dual flocculants.

Research was conducted to obtain an optimum time differential between the addition of dual flocculants, aluminum sulfate and polyelectrolytes, to a colloidal suspension. A synthetic colloidal suspension, latex, was used in order to achieve the best available reproducibility. Both cationic and anionic polyelectrolytes were examined in conjuction with aluminum sulfate (alum). To simplify tests, pH, ionic strength, and temperature were held constant. The dependent parameters for destabilization measurement were turbidity, total solids, zeta potential, and A13+ concentration. Various alum concentrations, polyelectrolyte concentrations, and time intervals were examined. For the cationic polyelectrolyte, the optimum time for addition was dependent upon amount of alum used, but the cationic polyelectrolyte should always be added after the alum. The optimum time for the anionic polyelectrolyte was 5 minutes after alum had been added to the system. The latex suspension gave reproducible results during the testing period. The use of zeta potential measurements along with the turbidity and total solids proved useful in evaluating what happened in the suspension. Turbidity by itself could be misleading

ing. The time difference between the addition of primary and secondary flocculants affects the efficiency of coagulation in a synthetic colloidal system, this conclusion is probably at least qualitatively valid for real colloidal systems. Water treatment plants should attempt to evaluate this time factor to improve water treatment without additional chemical cost. (See also W76-12212) (Hain-New Mexico State)
W76-12211

REPRODUCIBILITY EVALUATION OF THE FLOCCULATION OF A SYNTHETIC LATEX COLLOIDAL SYSTEM,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
S. Wu, and W. A. Barkley.
Available from the National Technical Information Service, Springfield VA 22161, as PB-257 737, $4.50 in paper copy, $3.00 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, WRRI Report No. 062, March 1976, 62 p., 13 fig., 8 tab., 33 ref. OWRT A-047-NMEX(2).

Descriptors: *Colloids, *Waste water treatment, *Chemical precipitation, Zeta potential, Turbidity, Hydrogen ion concentration, Polyelectrolytes, *Coagulation.
Identifiers: *Coagulants, *Alum, Total solids, Latex.

The reproducibility of a series of jar tests on colloidal destabilization and the performance of alum and cationic polyelectrolyte were investigated. Using synthetic latex suspension as a model colloidal suspension, ten test conditions based on pH, cationic strength, alum, and cationic polyelectrolyte destabilization were investigated. Three dependent variables (zeta potential, total solids and turbidity) were used to express the destabilization of the colloidal suspension. The results were evaluated by statistical analysis. Alum performed better than the cationic polyelectrolyte. Alum and cationic polyelectrolyte used jointly as primary coagulants gave the most reproducible result. (See also W76-12211) (Hain-New Mexico State)
W76-12212

ENERGY COSTS OF WASTEWATER REUSE,
Arizona Univ., Tucson. Economic and Business Research.
D. E. Pingry.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 518, $3.50 in paper copy, $3.00 in microfiche. Completion Report, Sept. 1, 1976. 11 p, 3 tab, 6 ref. OWRT A-068-ARIZ(1). 14-34-0001-6003.

Descriptors: Econometrics, *Estimated costs, *Water reuse, *Regression analysis, Cost analysis, Treatment facilities, Arizona, *Waste water treatment.
Identifiers: *Wastewater resue, *Energy use(Costs).

Functions were estimated using regression techniques which relate cost and energy use of wastewater treatment plants to measures of flow, treatment load and level of use. The sample of plants is drawn from Arizona and consists of plants which are or could be engaged in wastewater reuse. The resulting functions are used to estimate net water gain from reuse. In addition bounds on the value of water relative to energy which are necessary for reuse to be economical are calculated.
W76-12215

DISPOSAL ALTERNATIVES FOR INTERMITTENT SAND FILTER SCRAPINGS UTILIZATION AND SAND RECOVERY,
Utah Center for Water Resources Research, Logan.
J. T. Elliott, D. S. Filip, and J. H. Reynolds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 492, $4.50 in paper copy, $3.00 in microfiche. Utah Water Research Laboratory Publication, PRJER033-1, June 1976. 54 p, 40 fig, 42 tab, 41 ref, 3 append. OWRT A-033-UTAH(1). 14-34-0001-6046.

Descriptors: Filtration, Lagoons, Algae, Irrigation, Soils, *Oxidation lagoons, *Waste water disposal, *Cost analysis, *Filters, Sands, Bioassay, Lysimeters, Fertilizers, Alternative costs, *Utah, Water reuse.
Identifiers: Logan(Utah), *Sand filters, *Land application, Soil conditioners.

A three phase study is used to develop disposal alternatives and cost analysis for algae laden sand scrapings removed from intermittent sand filters used to polish wastewater lagoon effluent. Phase I, Irrigation Technique, explores the feasibility of supplying sufficient water to sand scrapings to leach out entrapped material. Details of removal with amount of water applied are presented. Phase II, Soil Application, tests with lysimeters soil response to application of the algae laden sand material. Physical and chemical parameters are not markedly altered where algae laden sand is applied to the soil surface. Phase III, Plant Bioassays, grew tall fescue on lysimeters which had algae laden sand scrapings applied and compared this growth response with lysimeters having no additives to a clay soil and lysimeters having ammonium nitrate added as fertilizer. Results indicate that all three disposal alternatives are viable recourses for sewage sand filter sand deposition and utilization. Cost analysis indicates that an irrigation technique may be less expensive.
W76-12219

SANITARY EVALUATION OF THE CONDITIONS OF SOIL DECONTAMINATION OF WASTEWATERS OF HYDROLYSIS PLANTS OF THE UZBEK SSR, (IN RUSSIAN),
Uzbekskii Nauchno-Iddledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
I. Usmanov.
Gig Sanit. 4, p 108-109, 1974.

Descriptors: *Water reuse, *Irrigation, Hydrolysis, Water pollution sources, *Cotton, Nitrification, Self purification, Dilution, Crop production, Bacteria, Soils, Treatment facilities.
Identifiers: Uzbek-SSR.

Irrigation of soils with the wastewaters of the Yangiyul biochemical (hydrolysis) plant in the Uzbek SSR in various dilutions in laboratory conditions did not have an adverse effect on processes of nitrification and bacterial self-purification; field experiments showed that irrigation with wastewater in a dilution of 1:1 and without dilution accelerated the development of cotton plants and increased the yield of cotton per plant.--Copyright 1975, Biological Abstracts, Inc.
W76-12257

SOME CAUSES OF ANOMALIES IN OXYGEN MASS TRANSFER IN POLLUTED WATER, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Wood Chemistry.
O. Y. Vitols, V. P. Paicha, and R. E. Reizin'sh.
Latv Psr Zinat Akad Vestis. 9, p 24-30, 1973.

Descriptors: *Oxygen, *Mass transfer, *Aeration, Oxygen demand, Bacteria, Model studies, Activated sludge, *Sludge treatment, *Waste water treatment.
Identifiers: *Aerators.

Coefficient alpha of polluted water (model) in 2 different aerated laboratory vessels was investigated. In the presence of SAS (surface active substances) it depended on the type of aerator. In the presence of biological systems, the O2 consumption depended on the physiological condition of the bacteria, which are very sensitive to changes in the O2 concentration. Large changes in the physiological condition occur even after short-term (10-20 min) subjection to the complete absence of O2. The efficiency of the aerator in the presence of bacterial sludge was detectable only under natural conditions and allowed only minor deviations from industrial ones.--Copyright 1975, Biological Abstracts, Inc.
W76-12265

EXPERIENCE IN DECONTAMINATION OF INDUSTRIAL WASTES AND TREATMENT PLANT SEDIMENTS IN LENINGRAD, (IN RUSSIAN),
S. A. Goiman, and A. Y. Dudarev.
Gig Sanit. 10, p 94-96, 1974.

Descriptors: *Industrial wastes, *Operation, Treatment facilities, Waste water treatment, *Water pollution treatment, Sediments.
Identifiers: *Leningrad(USSR).

The operation is described of an 50-hectare plot allotted for decontamination of industrial wastes formed during production and of sediments extracted from industrial wastewater treatment plants.--Copyright 1975, Biological Abstracts, Inc.
W76-12291

DEVICE FOR AERATING WATER BODIES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
For primary bibliographic entry see Field 5G.
W76-12311

WOOL PROCESS WATER PURIFICATION PLANT.
South African Patent ZA 7305-609. Issued June 11, 1974. Derwent French Patents Abstracts, Vol. V, No. 35, p F2-F3, July, 1974.

Descriptors: *Patents, Oil wastes, *Textiles, *Industrial wastes, *Waste water treatment, Water reuse, Separation techniques, Evaporation, Recycling.
Identifiers: *Wool process waste water.

The design for a wool process water purification plant has been patented. The oily or dirty water from baths for washing and rinsing wools is subjected to a first mechanical purification. During this purification, crude earth and mud are extracted and gathered together to form a throw-out and water is recovered to be reused. The throw-out then goes through a second mechanical purification during which heavy earth and oils are separated and recovered and light mud particles are separated and recycled with the throw-out. The effluent from the second purification is separated and recovered by evaporation. The condensation water is reused; the residual oils and earth are extracted and recovered from the residue of the evaporation stage by mechanical separation. The residual water is also extracted by mechanical separation and then recycled for evaporation with the effluent from the second purification. (Orr-FIRL)
W76-12338

SIEVE UNIT FOR AQUEOUS SLUDGE AND FIBROUS (SUSPENSIONS).
German Patent DS 2028-336. Issued May 16, 1974. Derwent German Patents Abstracts, Vol. V, No. 21, p F3, June, 1974.

Descriptors: *Sludge treatment, *Textiles, *Pulp wastes, *Pulp wastes, *Fibers(Plant), *Sieves, *Patents, Liquid wastes, Filtration, :Waste water treatment, Industrial wastes.

A sieve unit for treating aqueous sludge and fibrous suspensions has been patented. It consists of a cylindrical, horizontal, stationary drum, with a coaxial perforated cylinder that can rotate inside the drum. A material infeed and a diluent liquid infeed enter the chamber from the same side. An inlet chamber is located between the liquid-infeed and the cylinder and is rigidly connected to the cylinder. The cylinder has an opening on the opposite end face, toward the coarse discharge connection. Applications of this apparatus include the filtering of effluents from textile and fiber mills. (Orr-FIRL)
W76-12339

SEPARATION OF WATER-SOLUBLE HEAVY METAL IONS FROM ACID STREAMS.
Netherlands Patent NL 7400-526. Issued July 17, 1974. Derwent Netherlands Patents Report, Vol. V, No. 31, p D3, September, 1974.

Descriptors: *Patents, *Metals, *Separation techniques, Ion exchange, Resins, Chemical precipitation, Mines, Waste water treatment, Chelation, Acid mine wastes.
Identifiers: Electroplating wastes, Cation exchange resins.

A procedure for the separation of water soluble heavy metal ions from acid streams has been patented. Aqueous solutions containing water soluble metal ions are passed through a cation exchange resin containing alkali ions. The heavy metal ions are deposited on the resin, producing a neutral effluent. The cation exchange resin is regenerated with a solution of an alkali metal chelate such as sodium acetylacetonate in alcoholic solution. The metal is then precipitated from the solution with an alkali metal hydroxide; the alkali earth metal chelate is recovered and recycled. This method can be applied to waters used in draining mines and in electroplating metal cleaning. (Orr-FIRL)
W76-12340

DECONTAMINATION OF WATER CONTAINING LIPOPHILIC SUBSTANCES.
Belgian Patent BE 805-716. Issued April 5, 1974. Derwent Belgian Patents Report, Vol. V, No. 17, p D1, May 31, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Water pollution control, Flocculation, Polymers, Surface waters, Groundwater, Rivers, Potable water, *Patents.
Identifiers: *Lipophilic substances.

A patent was granted for a process for decontamination of water containing lipophilic substances such as mineral oils and pesticides. This involves flocculation treatment with ethylene polymers or copolymers which have less than 50 weight percent of other ethylenic monomers. The polymer used must also contain less than 2 mole percent, based on the monomers used, of a monomer having a carboxyl function, particularly carboxyl acids, esters or amides. The process is followed by a separation of polymer-containing contaminants. This process eliminates pollutants from surface water, groundwater, and river water, and results in water of potable quality. (Murphy-FIRL)
W76-12341

WOOL PROCESS WATER PURIFICATION PLANT.
French Patent FR 2196-971. Issued April 26, 1974. French Patents Abstracts, Vol. 5, No. 21, p D3-D4, June 28, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Patents, Water reuse.
Identifiers: *Wool scouring liquor, Fuller's earth, Grease.

A patent was issued for a wool process water purification plant. Separation of fullers' earth sludge and fatty substances on a continuous recycling basis is achieved. Greasy wool passes through a series of washing tanks followed by rinsing baths. The washing water from the tanks is sent through a first mechanical purification phase in which raw earths, slurries, grease and water are separated. The water is fed back to the wash tanks, and the solids, without the grease, are remixed and fed to a second mechanical purification stage. Heavy earths and lighter sludge are extracted, followed by grease extraction and then by evaporation of the water condensate which was used in the rinsing baths. The remaining residue is further segregated and the water recycled. (Kramer-FIRL)
W76-12342

EVALUATING A LOW-ENERGY, HIGH-VOLUME PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOONS BY MIXING,
Oklahoma State University, Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-12344

THE RENOVATION AND REUSE OF WATER FOR DILUTION AND HYDRAULIC TRANSPORT OF DAIRY CATTLE MANURE,
Massachusetts Univ., Amherst. Dept. of Agricultural Engineering.
R. E. Graves.
Available from University Microfilms, Ann Arbur, Michigan 48106. PhD Thesis, June, 1971, 120 p. 31 fig, 18 tab, 61 ref.

Descriptors: *Water reuse, *Waste dilution, Recycling, *Farm wastes, *Cattle, *Dairy industry, *Hydraulic transportation, Water pollution, Chemical oxygen demand, Biochemical oxygen demand, Ammonia, Nitrates, Waste treatment, Liquid wastes, Phosphate, Chlorides, Slurries, Aerobic treatment.
Identifiers: *Screening.

An evaluation was made of the concept of pretreatment by screening combined with aerobic stabilization and reuse of water as they might apply to the hydraulic handling of dairy cattle manure. Performance of a stationary sloping screen for separating solid material from dairy manure slurries was evaluated using different bar spacings and different slurry mixtures. Two different systems were used to treat screen effluent. One system consisted of primary settling, aeration and final settling; the other of aeration and final settling. No adverse effects on the treatment systems were noted from the reuse of water. Screening of water-manure slurries removes a significant amount of material from the liquid and makes subsequent treatment and handling easier. Screen effluent may then be irrigated, stored aerobically, or treated to allow reuse for hydraulic cleaning. The addition of screening will improve the operation of many systems now used for treatment of animal manure slurries. (Russell-East Central)
W76-12345

LOW-COST DISPOSAL SYSTEMS FOR FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5G.
W76-12346

SECOND NATIONAL SYMPOSIUM ON POULTRY INDUSTRY WASTE MANAGEMENT.
Held at University of Nebraska, Lincoln, May 19-20, 1964, 262 p. $5.00.

Descriptors: *Poultry, *Farm wastes, *Waste disposal, Lagoons, Odor, Legal aspects, Equipment, Waste treatment, Waste water treatment, Waste water disposal.
Identifiers: *Waste management.

Waste management is an issue that the poultry industry must be prepared to deal with. This Second National Symposium did a great deal to inform the poultry industry of current waste management alternatives. As expected, lagoons were discussed extensively throughout the symposium. Many problems such as poultry waste disposal on the farm, in the hatchery, and in the processing plants were discussed. Hydraulic manipulation of wastes was described along with considerations of proper odor control. Legal, social, and economic aspects of waste management were also dealt with. Much more study and research is needed so that the poultry industry can better deal with the problems and changes of the future. (Russell-East Central)
W76-12347

SURMOUNTING THE POULTRY WASTE PROBLEM,
Cornell Univ., Ithaca, N. Y. Dept. of Poultry Science.
C. E. Ostrander.
In: Proceedings and Abstracts, XV World's Poultry Congress and Exposition, New Orleans, Louisiana, August 11-16, 1974, p 219-221. 6 ref.

Descriptors: *Poultry, *Excreta, Anaerobic digestion, Dehydration, Odor, Methane, Fertilizers, *Farm wastes, Waste treatment, Waste disposal.
Identifiers: *Waste management, Deep pit house, High rise house, Oxidation ditch, Aerated pond, Soil injection.

Choice of a poultry waste management system is dependent upon location, climate, size of operation, amount of land, cropping possibilities, etc. Among poultry waste management choices are the following: (1) deep pit, (2) high rise, (3) anaerobic systems, (4) aerobic systems such as oxidation ditches and surface aeration, (5) soil injection, (6) dehydration and (7) methane production. Of the two dry systems (deep pit and high rise), the high rise house maintains dry manure conditions more easily. For both systems, groundwater seepage, excess water, and air circulation may be problems. Of the liquid systems, an aerobic system would only be recommended for an isolated area due to its odor. Conversely, an aerobic system would be better for a populated area. Where odors are a problem at spreading time, soil injection may be used to eliminate the problem. Actual recycling of farm wastes through dehydration and refeeding or through methane production is still largely experimental. The use of dehydrated manure as a fertilizer is also being eyed with interest. (Merryman-East Central)
W76-12348

PHOTOSYNTHETIC RECLAMATION OF AGRICULTURAL SOLID AND LIQUID WASTES,
California Univ., Berkeley. Sanitary Engineering Research Lab.
W. J. Oswald.
Summaries of Solid Waste Research and Training Grants, EPA Publication No. SW-5r, p 85-86. 5 ref.

Descriptors: *Solid wastes, *Liquid wastes, Agriculture, Poultry, *Anaerobic digestion, Algae, Effluent, Aeration, Costs, *Farm wastes, *Waste treatment, Fermentation, Photosynthesis.
Identifiers: *Photosynthetic reclamation.

In a pilot plant at Richmond, California, the wastes from a hen house were fermented in an anaerobic digestion tank with the effluent feeding directly into an algae pond. Water from the pond was used for flushing in the hen house, and the algae were fed to the hens. The pond was aerated

during the winter. Algae production was 30 to 40 tons (dry wt) per acre of pond. The net waste-handling cost would be one cent or less per dozen eggs. (East Central)
W76-12349

MAINE GUIDELINES FOR MANURE AND MANURE SLUDGE DISPOSAL ON LAND.
Maine Univ., Orono. Cooperative Extension Service.
For primary bibliographic entry see Field 5G.
W76-12353

RELATING AGRICULTURAL INSTRUCTION TO ENVIRONMENT IMPROVEMENT: THE ROLE OF LAND AND SOIL,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
For primary bibliographic entry see Field 5G.
W76-12354

QUALITY OF POTATOES GROWN ON FIELDS IRRIGATED WITH WASTEWATERS OF COAL-TAR CHEMICAL AND METALLURGICAL PLANTS, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-12355

RISER INTAKE DESIGNS FOR FEEDLOT SOLIDS COLLECTION BASINS,
Agricultural Research Service, Lincoln, Nebr.
C. L. Linderman, N. P. Swanson, and L. N. Mielke.
67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No. 74-3030, 7 p. 3 fig, 5 ref.

Descriptors: *Feed lots, *Solid wastes, Agricultural runoff, *Farm wastes, *Waste treatment, Design.
Identifiers: *Collection basins, *Riser intake designs.

Given the size and shape of a feedlot debris basin, a riser intake and conduit can be designed to remove the runoff from the design storm within a desired time. Either corrugated metal pipe (CMP) or plastic pipe with 5/8-inch drilled holes is very satisfactory for riser intakes. Comparisons of material requirements, installation labor, and operating experiences indicate that either type of intake is equally satisfactory with the choice dependent on operator preference. Zinc-plated CMP is not excessively deteriorated by contact with runoff and animal wastes. If the basins are cleaned before solids accumulation seriously interferes with drainage, the intakes will operate with little maintenance. (East Central)
W76-12356

ECONOMIC EVALUATION OF LIQUID MANURE DISPOSAL SYSTEMS FOR DAIRY CATTLE,
Economic Research Service, Madison, Wis. Farm Production Economics Div.
For primary bibliographic entry see Field 5G.
W76-12357

YOU HAVE TO 'THINK MAINTENANCE' IN MANAGING FEEDLOT RUNOFF SYSTEMS,
Nebraska Farmer, 2 p., February 3, 1973. 3 fig.

Descriptors: *Feed lots, *Agricultural runoff, *Operation and maintenance, Costs, *Farm wastes, Management, Water pollution control, Waste treatment.
Identifiers: *Debris basin, *Holding ponds, Waste management.

Feedlots need proper maintenance. The best designed runoff control system can fail if it cannot be maintained properly. To keep cleaning chores easy one feedlot operator has installed gates at the end of debris basins and lot fences on top of debris dikes. These are used so that scraper equipment can remove manure solids which would have been left on the fence row and prevent the manure from being pushed under fence lines by livestock traffic. The final phase of the runoff system is a holding pond which holds storm runoff and pumps the wastes onto field crops. Problems of the system have been clogged riser slots caused by manure solids and hair and problems in pumping the wastes out of the holding pond onto field crops. (Marquard-East Central)
W76-12360

WLJ PREVIEWS FIRST COMMERCIAL MANURE SYSTEM,
G. Richardson.
Western Livestock Journal, Vol. 51, No. 1, p. 1, 7, November 6, 1972. 2 fig.

Descriptors: *Aerobic treatment, Dairy industry, Feed lots, Foam separation, Recycling, Lagoons, Degradation(Decomposition), Waste water treatment, Waste treatment, Odor, *Farm wastes.
Identifiers: Licom waste treatment system, *Odor control, Centrirator, Pasteurization.

DeLaval Separator Company has introduced the Licom Waste Treatment System, which can turn farm wastes into clear water and odor-free, pathogen-free mulch. Licom Systems I and II may be used for smaller operations while Licom III is used for those feedlots which must meet rigid ecological requirements. Licom I uses a liquid manure collecting pit which fills a reactor once weekly with wastes. In the reactor, aerobic bacterial action raises the temperature into the thermophilic range and in 5 to 7 days complete stabilization, decomposition, and pasteurization have occurred. Licom II uses the same procedure only with more reactors for more complete decomposition. Licom III is like Licom II with the addition of a flotation tank that separates fibrous matter from the liquid. For feedlots already using lagoons, a DeLaval Centrirator may be installed which will eliminate odors. (Marquard-East Central)
W76-12361

SOIL CONSERVATION SERVICE, TEXAS TECH UNIVERSITY WORKSHOP COMMITTEE ON FEEDLOT WASTE.
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12363

FACTORS AFFECTING QUALITY AND QUANTITY OF FEEDLOT WASTE COLLECTIONS,
Texas Tech Univ., Lubbock. Water Resources Center.
D. M. Wells.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 3 p.

Descriptors: *Liquid wastes, *Solid wastes, *Slurries, *Gases, *Feed lots, Slopes, Feeds, *Farm wastes, *Cattle, Cleaning, Waste treatment.
Identifiers: *Feedlot waste collection.

Feedlot wastes occur in the liquid, solid, slurry and airborne forms. Factors that affect the pollution potential of these wastes are (1) size of cattle, (2) density of cattle, (3) slope of feedlot, (4) type of surfacing material, (5) type of ration fed, (6) climatic factors, (7) frequency of cleaning. The general way each of these affected feedlot wastes is given. (See also W76-12363) (Kehl-East Central)
W76-12364

MANAGEMENT OF RUNOFF WATER IN RELATION TO FEEDLOT OPERATIONS,
Soil Conservation Service, Temple, Tex.
H. N. McGill.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 13 p. 6 fig, 2 tab.

Descriptors: *Feed lots, *Agricultural runoff, *Irrigation, *Storage capacity, *Farm wastes, Ponds, Management, Waste treatment, Texas, Waste disposal.
Identifiers: Holding ponds.

A system of runoff retention and irrigation is generally considered to be the most practical and economical form of runoff control in Texas. Because of this, information was gathered to determine necessary size ratios of irrigated areas to feedlot areas for adequate runoff control. The study revealed that the required storage capacity varies with the ratio of irrigated area to feedlot area and the location in the state. The eastern part of the state would need a large amount of storage capacity. Considerable flexibility of operation is permitted in the western part of the state by holding ponds with the capacity to impound 25-year, 24 hour runoff from feedlots. Although feedlot runoff is not a dependable irrigation water supply, it can be used to supplement other sources. (See also W76-12363) (Kehl-East Central)
W76-12365

SOIL CONSERVATION SERVICE STANDARD AND SPECIFICATIONS FOR POLLUTION ABATEMENT MEASURES FOR CONFINED LIVESTOCK OR POULTRY FEEDING OPERATIONS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12367

GUIDELINES FOR HANDLING LIQUID WASTE FROM FEEDLOTS,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5G.
W76-12368

HYGIENIC EVALUATION OF POTATOES GROWN IN SOIL IRRIGATED WITH EFFLUENTS FROM COKING AND CHEMICAL PLANTS OF THE DONETS COAL BASIN, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W76-12369

EVALUATION OF SOLID WASTE BALING AND BALEFILLS. VOLUME I,
Ralph Stone and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5A.
W76-12381

DISSOLVED OXYGEN PROBE,
Fischer and Porter Co., Warminster, Pa. (Assignee).
R. L. Poole.
U.S. Patent No. 3,948,746, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 315, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Water pollution treatment, *Aerobic conditions, Dissolved oxygen, *Monitoring, Instrumentation, Electrodes, Dissolved oxygen analyzers.
Identifiers: *Dissolved oxygen probes.

In aerobic treatment processes intended to purify sewage and industrial wastes, the dissolved oxygen is continuously measured in order to monitor and maintain the proper aerobic conditions. A

probe is described which incorporates a galvanic cell whose output current is proportional to dissolved oxygen. The highly sensitive probe also includes a temperature sensor to correct the readings for changes in the temperature of the liquid being tested. The probe has a hollow cylindrical casing of insulating material divided into a lower electrolyte chamber and an upper terminal chamber. Mounted on the stem coaxially within the electrolyte chamber is a tubular-shaped copper counter-electrode which is extended into the terminal chamber for electrical connection. The lower end of the electrolyte chamber is closed by a diffusion membrane which covers a measuring electrode and separates the cell from external liquid. The membrane is permeable to dissolved oxygen in the liquid in which the probe is immersed. Mounted on the end of the stem in the electrolyte chamber is a measuring electrode of gold or platinum, this electrode being connected to a terminal contact in the terminal chamber. The electrolyte chamber is filled with a solution of potassium hydroxide, so that when dissolved oxygen diffuses through the membrane, it is electrochemically reduced at the surface of the measuring electrode to generate a current proportional to the oxygen concentration. The copper counterelectrode is oxidized to complete the cell reaction. (Sinha-OEIS)
W76-12391

HYGIENIC EVALUATION OF ELECTRODIALYSIS WATER DESALINATION SET UP, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
G. I. Sidorenko, Y. A. Rakhmanin, G. I. Rozhnov, E. L. Lovtsevich, and N. A. Nazarova.
Gig Sanit. 10, p 10-16, 1974.

Descriptors: *Electrodialysis, *Desalination processes, Public health, Desalination plants, Operations and maintenance, *Disinfection, Microbial degradation, *Water treatment, *Waste water treatment.

The quality of the desalinated water and the hygienic effectiveness of the electrodialysis desalination method depend on the type and the construction of the installations, the regimen and the time of their running, the level of mineralization and the composition of the original water, the effectiveness of the methods of preliminary and final treatment, conditioning and microbial disinfection of water.--Copyright 1975, Biological Abstracts, Inc.
W76-12394

METHODS FOR REMOVING FLUOBORATES FROM AQUEOUS MEDIA,
Galson Technical Services, Inc., Syracuse, N.Y. (Assignee).
J. Singh.
U.S. Patent No. 3,959,132, 5 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1739, May 25, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water pollution sources, Chemical reactions, Separation techniques, Hydrolysis, Aluminum, Lime.
Identifiers: *Fluoborates, Lead and tin plating industry.

Lead and tin fluoborates and fluoboric acid are widely used in lead and tin plating processes and appear as contaminants in the water used to rinse the plated parts. It has been discovered that fluoborates can be rapidly and efficiently removed from aqueous media by first hydrolyzing the fluoborates to fluorides with aluminum or an aluminum salt and then reacting the resulting fluorides with a calcium salt. This converts the fluorides to calcium fluoride, which is sparingly soluble and accordingly precipitates and can be readily separated from the aqueous liquid. The form in which the aluminum is added can be varied. Filings or other finely divided aluminum metal particles or a salt such as aluminum chloride or sulfate can be used. The conversion of the fluorides to calcium fluoride will typically be completed in a period of 5-30 minutes depending upon the form in which the lime is added. The reactions will proceed much more rapidly if a slurry is employed rather than a dry powder. Other compounds capable of contributing calcium ions to the precipitation reactions can be employed. However, lime is preferred because it also produces the desired elevation of pH. Furthermore, lime is an inexpensive source of calcium ion. The aluminum can be readily reclaimed and recycled. (Sinha-OEIS)
W76-12398

APPARATUS FOR BIOLOGICAL AND CHEMICAL PURIFICATION OF WATER BY AGGLOMERATION,
Agrotechnika, narodny podnik, Zvolen (Czechoslovakia). (Assignee).
For primary bibliographic entry see Field 5F.
W76-12401

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC FLUSHING,
Desalination Systems, Inc., Escondido, Calif. (Assignee).
D. T. Bray.
U. S. Patent No. 3,959,146, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1744, May 25, 1976.

Descriptors: *Patents, *Water purification, *Demineralization, Water quality control, *Reverse osmosis, Membranes, Membrane processes, Semipermeable membranes, Cleaning, Equipment, Waste water treatment.
Identifiers: *Flushing(Automatic).

A reverse osmosis system for purifying water comprises a module containing a semipermeable membrane. Feed water is introduced under elevated pressure, and a flow control device releases concentrate from the module while maintaining operating pressure. A storage tank is provided with a spigot for dispensing purified water. A by-pass pipe is arranged around the flow control device. A valve, normally closed, is placed in the by-pass pipe and means are provided to automatically open this valve concomitantly with delivery of purified water from the storage tank. The feed water introduced into the module is allowed to flow freely through the module and the by-pass pipe around the flow control device to flush and clean the membrane surface each time purified water is delivered from the tank dispensing means. The valve in the by-pass pipe is connected electrically or mechanically to the storage tank or spigot so that it opens and closes concomitantly. (Sinha - OEIS)
W76-12402

METHOD FOR TREATING PULP-CONTAINING WASTE LIQUORS,
Nippon Carbide Kogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
M. Nakajima, and K. Kuwabara.
U.S. Patent No. 3,960,648, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 287, June 1, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Water pollution treatment, *Water purification, Water quality control, Flocculation, Resins, Separation techniques, *Pulp wastes.

A method is described for treating pulp-containing waste liquors by adding a flocculating agent and separating and removing the resulting flocculated matter. In treating a pulp-containing waste liquor, the dicyandiamide-formaldehyde resin is first added to the waste liquor and mixed with it uniformly, and then, aluminum sulfate is added. Removal of the flocculated matter obtained can be effected by separating the sedimented and/or floating matter by filtration or other optional solid-liquid separating operations. The degree of clarity of the waste water so treated shows a marked increase over the method comprised of adding aluminum sulfate first. (Sinha-OEIS)
W76-12404

METHOD FOR SLUDGE TREATMENT,
System AB Infoteknik, Vasteras (Sweden). (Assignee).
G. H. E. Bjermo, and P. E. Tresjo.
U.S. Patent No. 3,960,725, 3 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 307-308, June 1, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Heavy metals, Water pollution treatment, Separation techniques, Waste disposal, *Sludge treatment, Dewatering, Water reuse, Hazards, *Alkalis(Bases).
Identifiers: *Heavy metal hydroxides.

The invention relates to an automatic and continuous method of converting heavy metal hydroxides which are obtained in sludge from purification works for pickling, rinsing and surface-treatment plants, into heavy metal oxides in powder and/or granules. The method is carried out in five stages. In the first stage, the harmless solid and insoluble particles are separated. In the second stage the sludge is dewatered. The dewatering is continued to such an extent that the sludge obtains and retains a thixotropic character. In the third stage the sludge is treated so that it obtains such a consistency that it can be applied in the form of a 1-5 mm thick film onto a media carrier, which conveys the sludge through the fourth stage, where drying takes place in such a way that metal hydroxide in powder and/or granulated form is obtained. The granules are collected and concentrated in the fifth stage, and at the same time a subsequent sintering of the metal hydroxides takes place to form, under normal conditions, harmless metal oxides which are difficult to dissolve. The metal oxides are collected in appropriate containers, either for transportation or for recovery into metal. The steam heat used in the fourth and fifth stages can be utilized by means of heat exchangers, and the condensate, together with the water obtained in the second stage, can be discharged to the receiving body of water or can be returned as process water. (Sinha-OEIS)
W76-12410

CHEMICALS AND ALLIED PRODUCTS (LITERATURE REVIEWS),
Union Carbide Corp., South Charleston, W. Va.
R. F. Nelson, and J. C. Hovious.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1313-1318, June, 1976.40 ref.

Descriptors: *Reviews, *Bibliographies, *Chemical industry, *Waste water treatment, *Chemical wastes, *Biological treatment, *Byproducts, Physicochemical properties, model studies, Kinetics, Activated sludge, Biodegradation, Biochemical oxygen demand, Denitrification, Industrial wastes, Adsorption, Separation techniques, Water reuse, Ammonia, Coagulation.
Identifiers: *Literature reviews.

A review of literature dealing with methods for controlling water pollution resulting from chemical industry operations is presented. General topics covered include: biological treatment and biodegradability, physico-chemical treatment, and waste water byproduct recovery. Specific subjects discussed under the above general headings include: the verification of a kinetic model for the

design of completely mixed activated sludge systems, the influence of temperature and sludge age on biochemical oxygen demand removal, a prototype treatment plant for handling high concentrations of ammonia, the denitrification of munitions manufacturing waste water, the use of lime for pH neutralization and coagulation of industrial waste water, the technical and economic advantages of in situ regeneration of activated carbon, concepts for water reuse at a coal gasification plant, and cost comparisons of byproduct recovery using carbon adsorption-solvent regeneration and solvent extraction. (Kreager-FIRL)
W76-12412

PURIFYING WASTE LIQUOR - FROM E. G. SODIUM CARBONATE PRODUCTION, AMMONIA REGENERATION, BRINE PURIFICATION, ETC.,
Belgian Patent BE-837-919. Issued April 16, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 22, p D3, July 7, 1976.

Descriptors: *Patents, *Flocculation, *Waste water treatment, *Chemical industry, Chemical wastes, Byproducts, Ammonia, Brines, Carbonates, Sodium compounds, Separation techniques, Industrial wastes, Dewatering, Fertilizers, Cements.
Identifiers: Solvay process.

A patent for a process to purify liquid residual products obtained during the production of sodium carbonate by the Solvay process is described which allows for the recovery of solid products which in turn can be used for the production of fertilizer or cement. Aqueous solutions obtained during ammonia regeneration or during brine purification as well as aqueous suspensions obtained during limestone calcination are purified in the following steps: mixing the different residual products; concentrating the mixture to 8-12 weight % solids; adding a flocculating agent; separating the deposited solids during two or more operations, preferably with a centrifuge or disc filter; adding a liquid which is free of chloride ions to the separated solids during the two operations of step d; and mixing the liquid from the final separating operation of step d with the mixture from step a. The process requires relatively small equipment and only the use of a flocculating agent to give solids products having a low water content. (Kreager-FIRL)
W76-12413

$10-MILLION AGGREGATE PLANT RECYCLES PROCESS WATER,
Acres Consulting Services Ltd., Vancouver (British Columbia).
J. Robertson, and K. N. Pople.
Water and Pollution Control, Vol. 114, No. 6, p 19-20, 22, 26-28, June, 1976.3 fig.

Descriptors: *Recycling, *Water reuse, *Waste water treatment, *Symbiosis, Industrial water, *Treatment facilities, Equipment, Solid wastes, Water supply, Water conservation, Flocculation.
Identifiers: *Aggregate plants.

Water recycling in an aggregate plant with process water requirements of 6100 gallons/minute is described. All waste water flows are collected and treated for solids removal; and clarified water is recycled through the plant operation, accounting for about 90% of the plant requirements. Washings from gravel screens are recirculated directly to sand screens. Washings from crushed rock sizing screens and drainage water from reclaim tunnels are pumped to a waste sand dewatering screw for initial solids removal. Overflows from classifier tanks and from dewatering screws are pumped to a thickener for solids removal. Flocculants are added to the thickener feed to assist in water clarification and to increase the settling rate of solids. The clarified thickener overflow flows to a process tank where fresh make-up water is added for plant use. (Kreager-FIRL)
W76-12414

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
W. L. Hornung, and D. A. Baker.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1293-1295, June, 1976.27 ref.

Descriptors: *Reviews, *Bibliographies, *Oil industry, *Waste water treatment, *Water reuse, *Water pollution effects, *Sludge treatment, Model studies, Separation techniques, Kinetics, Oil wastes, Toxicity, Algae, Algal poisoning, Phenols, Sludge disposal, *Industrial wastes.
Identifiers: *Literature reviews.

A review of literature dealing with petroleum processing wastes is presented. Topics covered include: the use of sour water stripper bottom for desalter water, process wash waters, cooling tower make-up, and/or boiler water make-up; the use of an automated pontoon system for oil removal; the advantages of using gravity belt filtration for sludge treatment; comparison studies of thermophilic versus mesophilic anaerobic digestion; the results from tests involving the treatment of API separator effluents with activated carbon; the use of calcium hydroxide and aluminum sulfate for separating oils from petroleum emulsion waste water; chemical treatment processes for making sludge more amenable for landfill; and the use of a continuous flow kinetic model for assessing the effect of increased temperature on phenol toxicity to algae. (Kreager-FIRL)
W76-12415

CONTROLLING SURFACE WATER CONTAMINATION AT THE ESSO REFINERY AT ANTWERP (DE BESTRIJDING VAN DE VERONTREINIGING VAN HET OPPERVLAKTEWATER IN DE ESSO-RAFFINADERIJ TE ANTWERPEN),
L. Bossuyt.
Het Ingenieursblad, Vol 45, No 2, p 41-49, February, 1976. 7 fig, 5 tab.

Descriptors: *Surface waters, *Industrial wastes, *Waste water treatment, *Oil wastes, Coagulation, Separation techniques, Flocculation, Polyelectrolytes, Biochemical oxygen demand, Europe.
Identifiers: *Refinery wastes, Antwerp(Belgium).

The complex waste water treatment system at the Esso Petroleum Refinery at Antwerp, Belgium, is described. Waste water is generated at a rate of 8,500 tons/hour, and about 85% of the total waste water is cooling water. After preliminary oil separation, the waste water has an oil content of 30-50 g/cu m. After neutralization with sodium hydroxide, coagulation and flocculation with iron sulfate or aluminum sulfate and a polyelectrolyte, dissolved air flotation is performed to reduce the oil content to 10-15 g/cu m. Dissolved oil is finally removed by activated sludge treatment, which results in about 90% reduction of the BOD content. The residual oil content is below one g/cu m. (Takacs-FIRL)
W76-12416

THE CLOSED-CYCLE BLEACHED KRAFT PULP MILL,
Toronto Univ. (Ontario).
W. H. Rapson.
Chemical Engineering Progress, Vol 72, No 6, p 68-71, June, 1976. 2 fig, 22 ref.

Descriptors: Pulp and paper industry, *Pulp wastes, *Recycling, *Symbiosis, Industrial wastes, Costs, Water conservation, Effluents, Design criteria, *Treatment facilities, *Waste water treatment.

A closed-loop design for a bleached kraft pulp mill is described that provides for essentially effluent-free operation. The closed-cycle concept involves operating the wood room completely on recycled water. Accumulated suspended solids are settled, filtered or centrifuged out, and either burned or buried. A closed pressurized brown stock screening system uses only recycled filtrate. Screen rejects are filtered and recycled or burned. The amount of water used for washing the pulp in the bleach plant is sharply decreased by countercurrent washing and recycling chlorination filtrate to dilute unbleached pulp entering the first stage. Bleach plant effluent and evaporator condensates are used to wash the unbleached pulp and for other purposes in the chemical recovery system, eliminating the addition of fresh water in the pulping and chemical recovery systems. All chlorine in the bleaching chemicals ends up as sodium chloride which is recovered by a special process. Heat savings are also achieved as a result of decreasing the water requirements of the plant by using countercurrent washing. The capital cost of the closed-loop operation is expected to be only 5% more than conventional plants with no effluent treatment, and the operating cost is only 1% more than that of existing plants without treatment. (Kreager-FIRL)
W76-12417

PAPER MAKING WASTE-WATER PURIFICATION - BY FLOCCULATING, SEPARATING FIBRES FROM FLOCCULATE, ADDING FILTER AID, AND FILTERING SUSPENSION.
French Patent FR 2277-779. Issued March 12, 1976. Derwent French Patents Abstracts, Vol. X, No. 18, p D3, June 9, 1976.

Descriptors: *Patents, *Pulp and paper industry, *Waste water treatment, *Solid wastes, *Flocculation, *Filtration, *Industrial wastes, Byproducts, Centrifugation, Waste treatment, Pulp wastes, Symbiosis, *Pulp wastes.

A patent for a process to remove solids from waste water generated during paper production is described which provides for using pulp wastes as a filter aid. The process consists of the following steps: subjecting the waste water to flocculation, separating the flocculate, dividing the flocculate into a fibrous mass and a fiber-free suspension of waste material in water, adding a filter aid to the suspension which consists of material removed mechanically from the paper pulp prior to paper preparation, and separating the solid waste material from the suspension by filtering or centrifuging. The process also recovers fibers for addition to the pulp. (Kreager-FIRL)
W76-12418

THE EFFECT OF METHODS OF OPERATION OF AERATION BASINS ON THE DEVELOPMENT AND POPULATION DENSITY OF CULEX PIPIENS L. IN THE SOUTH OF THE RUSSIAN SFSR, (IN RUSSIAN),
Rostov Research Inst. of Medical Parasitology (USSR).
For primary bibliographic entry see Field 5G.
W76-12419

COAGULATION OF TEXTILE WASTE WATER,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
M. Olthof, and W. W. Eckenfelder.
Textile Chemist and Colorist, Vol 8, No 7, p 18-22, July, 1976. 8 tab, 11 ref.

Descriptors: *Textiles, *Color, *Coagulation, *Waste water treatment, *Sludge treatment, *Chemical oxygen demand, Organic compounds, Lime, Sulfates, Evaluation, Performance, Chemical wastes, Industrial wastes, Efficiencies, Economics.
Identifiers: Alum, Ferric sulfate, Textile finishing.

Coagulation techniques employing ferric sulfate, alum, and lime were evaluated in terms of their potential for removing color from mixed waste water generated by four textile finishing mills. The color content in the waste water was reduced by 80-90% when coagulation with ferric sulfate or alum was employed. Lime yielded a supernatant with a higher residual color content, and the required dosage was 1.5-4 times as high as the dosages for ferric sulfate and alum. Lime sludge was the most easily handled, while alum sludge was the most troublesome. For equivalent color removal, lime was slightly more economical than ferric sulfate and significantly more economical than alum. The most economical system was that in which lime or ferric sulfate was employed, depending on the effluent criteria. Lime resulted in an effluent with higher residual color and a high pH. Coagulation also resulted in the removal of between 30-60% of the organics (expressed as chemical oxygen demand) in waste water at optimum dosages for color removal. (Kreager-FIRL)
W76-12420

ZERO DISCHARGE AS EXEMPLIFIED BY TEXTILE DYEING AND FINISHING,
Clemson Univ., S. C. Coll. of Industrial Management and Textile Science.
J. J. Porter. and C. Brandon.
Chemtech, p 402-407, June, 1976. 9 tab, 5 ref.

Descriptors: *Textiles, *Dyes, *Waste water treatment, *Water reuse, *Filtration, Pilot plants, Reclamation, Evaluation, Performance, Symbiosis, Chemical oxygen demand, Color, Conductivity, Solid wastes, Economics, *Recycling, Treatment facilities.
Identifiers: Zero discharge(Textiles industry).

Hyperfiltration was successfully demonstrated on a pilot plant scale as being capable of renovating composite waste water from a textile dyeing and finishing plant. Both the purified product and concentrated residue from treatment of the composite waste with four commercial membrane modules were reused in production dyeings. The product water was satisfactory for use in all the dyeing operations for water recoveries up to 90%. Detailed performance data which include the average rejection percentage for total solids, color, conductivity, and chemical oxygen demand are tabulated for the following types of hyperfiltration membrane materials: polyamide, cellulose acetate in two different configurations, and zirconium(IV)-polyacrylic acid. Cost estimate comparisons are given for different membrane configurations. (Kreager-FIRL)
W76-12421

COST OF WATER POLLUTION CONTROL IN THE CARPET INDUSTRY,
Exxon Research and Engineering Co., Florham Park, N.J. Water Pollution Control Section.
For primary bibliographic entry see Field 5G.
W76-12422

TANNERY WASTE MANAGEMENT, (LITERATURE REVIEWS),
Cincinnati Univ., Ohio. Dept. of Environmental Engineering.
J. D. Eye.
Journal Water Pollution Control Federation, Vol 48, No 6, p 1280-1282, June, 1976. 15 ref.

Descriptors: *Reviews, *Bibliographies, *Tannery wastes, *Legal aspects, *Waste water treatment, *Reclamation, *Biological treatment, *Sludge treatment, Dewatering, Model studies, Aeration, Suspended solids, Chemical oxygen demand, Color, Sulfides, Lime, Evaluation, Performance, Industrial wastes, Chemical wastes.
Identifiers: Chrome, Tanneries.

A survey of literature dealing with the management of tannery wastes is presented. Topics covered include: legislation affecting tannery discharges; methods for reducing the amount of chrome in tannery effluent; laboratory studies involving the reuse of lime-sulfide unhairing liquors; laboratory procedures for recovering sulfide from unhairing liquors; studies of the biodegradation of chrome tannery wastes in extended aeration units; methods for reducing color, chemical oxygen demand, and total suspended solids in vegetable tanning effluents; the development of mathematical models for biological oxidation and sludge dewatering processes as applied to tannery wastes; and an assessment of the effectiveness of various aeration techniques for the oxidation of tannery wastes. (Kreager-FIRL)
W76-12423

SOME WASTE TREATMENT PROBLEMS IN THE HIDE AND LEATHER INDUSTRIES,
H. W. Young.
Leather Manufacturer, Vol 93, No 6, p 12, 15, 16, 18, 20, 22, 24, 28-31, June, 1976.

Descriptors: *Tannery wastes, *Waste water treatment, *Sludge treatment, *Separation techniques, *Dewatering, *Flocculation, Industrial wastes, Chemical wastes, Solid wastes, Emulsions, Organic compounds, Sulfides, *Industrial wastes.

Water pollution problems associated with chrome and vegetable tanning operations are discussed along with methods for their control. Topics covered include: the use of bar screens, Stehling screens, and other coarse screens to prevent the heavy debris from reaching pumps; problems associated with the plugging of pumps by matted hair and heavy hair burn liquors; the selection of final screening devices; the use of clarification for the separation of grease and solids; the effectiveness of flocculants for breaking grease emulsions; problems associated with the packing tendency of tannery sludges; the success of various methods for dewatering sludge from chrome leather tanneries; methods for the control of final effluent pH; and methods for reducing organic pollutant load and sulfide concentration in vegetable tanning waste streams. (Kreager-FIRL)
W76-12424

RECENT DEVELOPMENTS IN TANNERY EFFLUENT DISPOSAL,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
V. Every, L. S. Dorrington, D. E. Rawlings, D. R. Woods, and D. R. Cooper.
The Journal of the American Leather Chemists Association, Vol 71, No 6, p 276-287, June, 1976. 5 fig, 2 tab, 4 ref.

Descriptors: *Tannery wastes, *Waste water treatment, *Biological treatment, *Activated sludge, Industrial wastes, Chemical wastes, Oxygen demand, Pilot plants, Sulfides, Aeration, Performance, Evaluation, Treatment facilities, Lime.
Identifiers: Tanneries.

Recent developments in the treatment of tannery effluents are reviewed, with particular emphasis on aerobic activated sludge processes. Pilot plant studies indicate that surface aeration of tannery beamhouse liquor acidified to a pH of 9.0 results in an average oxygen demand removal of 76% for a 20-hour retention time without sludge return. Additional experiments indicate that lime usage can be brought down to 2% of hide weight, with the result being that a surface aerator is able to reduce the pH of the beamhouse effluent to approximately 8.0 in a 24-hour retention balancing tank with no addition of acid or manganese catalyst. The reduction of lime usage under these conditions not only eliminates the need for acid addition and flue gas treatment to achieve the proper pH but also results in sulfide removal without the use of a manganese catalyst. Results are also presented for studies on the effect of sludge age and retention time on the purification of fellmongery lime-sulfide effluent in a completely mixed activated sludge reactor. (Kreager-FIRL)
W76-12425

ADSORBENT MATERIAL FOR PURIFYING INDUSTRIAL EFFLUENTS BY PRECIPITATING BASIC NITROGENOUS POLYMER ON SUPPORT USING ACTIVATED MINERAL CLAY,
French Patent FR 2284-567. Issued May 14, 1976. Derwent French Patent Abstracts, X(26):D2, August 1976.

Descriptors: *Patents, *Adsorption, *Waste treatment, *Waste water treatment, *Industrial wastes, Tannery wastes, Pulp wastes, Chemical wastes, Pulp and paper industry, Chemical industry, Textiles.
Identifiers: Activated mineral clay.

A patent has been issued for an adsorbent material useful in the purification of industrial effluents from the textile, paper, leather, or dye manufacturing industries. The material is prepared by the precipitation of a basic, nitrogen-containing polymer on a support material by means of an activated mineral clay. The adsorbent is used to effect purification by either a mixing operation or use of a fixed bed. This method is cheaper than purification of similar effluents with traditional flocculating agents. (Kramer-FIRL)
W76-12426

NEW BEAMHOUSE DEVELOPMENT TO SIMPLIFY TANNERY WASTE WATER MANAGEMENT,
Instituut TNO voor Leder en Schoenen, Waalwijk (Netherlands).
P. J. Van Vlimmeren.
The Journal of the American Leather Chemists Association, Vol. 71, No. 7, p 318-335, July, 1976. 6 fig, 8 tab, 13 ref.

Descriptors: *Waste treatment, *Industrial wastes, *Chemical wastes, *Waste water treatment, *Tannery wastes, *Organic wastes, Pilot plants, Sludge, Byproducts.
Identifiers: Beamhouses.

A summary is presented of new developments in the management of tannery waste waters, particularly organic pollution arising from beamhouse operations. At TNO in The Netherlands, a completely new beamhouse system has been implemented, in which the special treatment of the residual soak and unhairing liquors from chrome leather manufacture led to a dramatic decrease in the organic pollution load. A sludge byproduct with attractive handling properties may also be obtained. Both laboratory and pilot plant scale experiments have been performed and the process has been adapted to several Dutch tanneries at full scale. (Kramer-FIRL)
W76-12427

EFFECT OF WET-AIR OXIDATION ON THE CHEMICAL COMPOSITION OF SEWAGE SLUDGES,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. E. Sommers, and E. H. Curtis.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-257 841, $3.50 in paper copy, $3.00 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 78. August 1976. 16 p, 2 fig, 4 tab, 6 ref. OWRT A-045-IND(1).

Descriptors: *Sewage sludge, *Sewage disposal, Fertilizers, Sewage treatment, *Waste water treatment, Oxidation, Nitrogen, Denitrification, Water reuse, Recycling, Chemical properties, Sampling.
Identifiers: *Wet-air oxidation, *Sewage sludge chemical composition, Land application(Sewage sludge).

Sewage sludge samples were obtained from waste streams in two sewage treatments before and after wet-air oxidation. Wet-air oxidation resulted in a 10 - 20% reduction in volatile solids. Concurrently, total N levels in the sludges decreased by >50% while P, Cu, Zn, Ni, Cd and Pb concentrations either increased or remained unchanged. From the standpoint of applying sewage sludge to agricultural land, inclusion of a wet-air oxidation unit in a treatment plant will decrease the desirability of utilizing sewage sludge as a fertilizer material.
W76-12462

UTILIZATION OF CLEAR WATER SEWAGE EFFLUENT IN MINERAL PROCESSING,
Arizona Bureau of Mines, Tucson.
W. W. Fisher.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-257 842, $4.00 in paper copy, $3.00 in microfiche. Completion Report, August 1976. 35 p, 15 fig, 13 tab, 7 ref. OWRT A-046ARIZ(1), 14-34-0001-6003.

Descriptors: *Sewage effluents, Waste water(Pollution), *Activated sludge, *Leaching, *Solvent extractions, Froth flotation, *Ion exchange, *Foam fractionation, Tertiary treatment, Waste water treatment, Copper, Molybdenum, Industrial water.
Identifiers: *Municipal waste water, *Agitation leaching, *Copper ore processing, Copper recovery, Molybdenum recovery, Metal recovery.

Secondary treated sewage effluent was substituted for normal process water in laboratory tests simulating the unit operations of agitation leaching, solvent extraction and froth flotation applied to copper ores. The combined processes of agitation leaching followed by solvent extraction were not adversely affected by sewage effluent. However, froth flotation recovery of copper and molybdenum sulfides showed significant detrimental response to sewage effluent. First, a voluminous, difficulty controlled froth was generated, even in the absence of a frothing agent, that has little mineral carrying ability. Second, sewage effluent caused a small loss in copper recovery and a large loss in molybdenum recovery. The detrimental effects of sewage effluent on flotation were partially overcome by tertiary treatment of the effluent by activated carbon adsorption and anion exchange. The frothing problem was significantly reduced after treating the sewage effluent by foam fractionation. Dilution of the effluent with normal process water resulted in a significant improvement in metal recovery. In addition, the large loss in molybdenum recovery was overcome by using a secondary collector in a combination reagent schedule. However, the secondary collector caused an appreciable loss in copper recovery.
W76-12464

WATER POLLUTION CONTROL IN THE SCANDINAVIAN COUNTRIES,
National Water Board of Finland, Helsinki.
A. Haverinen, and K. Noukka.
Naturopa, No. 20, p 14-17, 20, 1974. 5 illus, 8 ref.

Descriptors: *Water pollution control, Europe, *Foreign countries, *Pulp and paper industry, Waste treatment, *Waste water treatment, *Pulp wastes, Sulfite liquors, Water reuse, Legislation, *Municipal wastes, Sewage treatment, Water quality control, Water pollution sources, Wastes, *Industrial wastes, Sulfite liquors.
Identifiers: *Sweden, *Finland, Scandinavia, Sulfite mills.

The extent of water pollution in Finland and Sweden is described, and municipal sewage treatment programs in both countries are reviewed briefly. Water pollution control in the Scandinavian pulp and paper industries is discussed. In Sweden, small polluting sulfite mills have been replaced with modern facilities featuring extensive pollution control. All but two of Finland's 33 pulp mills recover their spent pulping liquors. (One of these two mills will be closed shortly, and the other is installing facilities to burn the waste liquor). Emphasis in both countries is on reuse and recovery of waste waters. Some aspects of the environmental protection agreement between Finland and Sweden are Discussed. (Witt-IPC)
W76-12473

MILL EFFLUENT TREATMENT AND FIBER RECOVERY.
Effluent and Water Treatment Journal, Vol. 15, No. 12, p 633, December, 1975. 1 fig.

Descriptors: *Waste water treatment, *Flotation, *Pulp wastes, Wastes, *Industrial wastes, Water pollution treatment, Water pollution sources, Water pollution control, Waste treatment, Screens, Polyelectrolytes, Flocculation, Water purification, Water quality control.
Identifiers: *Fiber recovery, Thames River(England), Kraft mills.

Effluent from Kent Kraft Mills in Northfleet (England) flows through a closed culvert to a sump where coarse tramp material is removed by a manually raked bar screen. The effluent is then dosed with a polyelectrolyte flocculant (not specified) and pumped to an adjacent 30-ft diameter dissolved air flotation unit. The fiber flocs on the surface are removed and returned to the hydrapulper. Clarified effluent is discharged to a second sump and then to the River Thames. Grit from the air flotation unit is discharged into the feed sump for periodic removal by the sludge gulper. The mill produces kraft sack papers from both kraft waste paper and unbleached fresh kraft pulp. (Witt-IPC)
W76-12474

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
M. Erickson, and C. W. Dence.
Svensk Papperstidning, Vol. 79, No. 10, p 316-322, June 20, 1976. 2 fig, 17 ref, 4 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Phenols, Wastes, *Industrial wastes, Water pollution sources, Chlorine, Oxidation, Potassium compounds, Gas chromatography, Mass spectrometry, Lignins, Softwood, Water pollution, Alkalis(Bases), Separation techniques, Organic acids, Organic compounds, Aromatic compounds, *Chlorination, *Waste water treatment, Pollutant identification.
Identifiers: Alkaline extraction, Potassium permanganate, Kraft pulp, Hydrochloric acid, Kappa-number, Kraft mills, Chlorophenols.

Softwood kraft pulp (kappa-number 28.2) was chlorinated with 3.6 and 6.0% applications of chlorine, washed with dilute HCl, and extracted with alkali. The undiluted spent chlorination and alkaline-extraction liquors and the corresponding pulps were oxidized with potassium permanganate to convert the oligomeric phenolic residues contained in them to monomeric aromatic carboxylic acids which were then identified using gas-chromatographic and mass-spectrometric techniques. In the spent chlorination liquors 11 phenolic compounds were detected. Combined yields of their oxidation products indicated a concentration of about 10 ppm for phenolic residues in each of the 2 original liquors (from 3.6 and 6% chlorine). Mono-, di-, and trichloro-substitution was observed on what were originally uncondensed lignin oligomers in the liquors. The presence of 5- and 6-linked condensed phenolic units containing from nil to 2 chloro substituents per phenolic ring was also confirmed. In the spent caustic extraction liquors 13 phenolic compounds were positively or tentatively identified. The estimated total concentration of phenolic substances was about 100 ppm in the liquor from 6%- chlorinated pulp, but much higher (ca. 190 ppm) in the liquor from the 3.6%-chlorinated pulp. The chlorinated pulps contained the same kinds of phenolic compounds as did the spent chlorination liquors, but in higher concentrations. Permaganate oxidation of alkali-extracted pulp indicated that the combination of chlorination plus caustic extraction had removed all but traces of phenolic substances. (Brown-IPC)
W76-12475

POLLUTION CONTROLS -- CONSULTANT'S ROLE,
Mason (H. C.) and Associates, Inc., Gladstone, Oreg.
For primary bibliographic entry see Field 5G.
W76-12478

ULTIMATE DISPOSAL OF BIOLOGICAL SLUDGES -- A NOVEL CONCEPT,
B.C. Research, Vancouver.
For primary bibliographic entry see Field 5E.
W76-12481

VERSATILE FILTRATION UNIT (VIELSEITIG EINSETZBARE FILTRATIONSANLAGE).
Allgemeine Papier-Rundschau, No. 16, p 562, April 20, 1976. 1 fig.

Descriptors: *Filters, *Waste water treatment, *Pulp wastes, Waste treatment, Water pollution treatment, Foreign countries, Equipment, *Filtration, Water purification, Membranes.
Identifiers: Ucarsep filter, *Germany.

The German 'Ucarsep' ultrafiltration unit described (made by Metallgesellschaft AG., Germany) is designed for many purposes, including effluent purification. Advantages claimed include high chemical, thermal, and mechanical resistance of the filtering membranes, continuous operation, high performance, favorable ratio of membrane area to module volume, and compact construction. (Ward-IPC)
W76-12485

REMOVAL AND RECOVERY OF PHENOLS FROM INDUSTRIAL WASTE EFFLUENTS WITH AMBERLITE XAD POLYMERIC ADSORBENTS,
Rohm and Haas Co., Philadelphia, Pa.
E. H. Crook, R. P. McDonnell, and J. T. McNulty.
Industrial and Engineering Chemistry, Product Research and Development, Vol. 14, No. 2, p 113-118, June 1975. 10 fig, 3 ref, 3 tab.

Descriptors: *Phenols, *Waste water treatment, *Ion exchange, Effluents, Water pollution sources, Wastes, Industrial wastes, Separation techniques, Waste treatment, Resins, Organic compounds, Aromatic compounds, Chemical wastes, Chemicals, Water pollution treatment, Water quality control, Water pollution control.
Identifiers: *Amberlite ion exchange resins, Bisphenol A, p-Nitrophenol, Acetone, Methyl alcohol, Ethyl alcohol.

Industrial waste effluents containing 280-6700 ppm of phenol, condensed phenol (bisphenol A), or substituted phenol (p-nitrophenol) were passed through columns containing Amberlite XAD polymeric sorbents in order to remove the phenolic compounds. Using Amberlite XAD-4, a total of 87 g/liter of phenol was removed from a waste effluent containing 6700 ppm of phenol; the resin column allowed less than 1 ppm of phenol leakage. Regeneration of the resin was effected by an acetone or methanol treatment. Acetone (for recycle in the regeneration step) and phenol (99% purity) were recovered by distillation. Bisphenol A (BPA) may be removed from a waste stream (280-910 ppm of BPA) by passage through columns of Amberlite XAD-4 and XAD-7. The capacity of XAD-4 and XAD-7 for BPA was 34 and 16 g/liter,

respectively. The resin was efficiently regenerated (95-100%) with 4% NaOH. p-Nitrophenol (1248 mg/liter) was removed from an industrial waste stream by passage of the effluent through a bed of Amberlite XAD-7. The resin had a capacity of 40 mg/liter at breakpoint of 7.0 mg/liter. The resin was efficiently regenerated with ethanol. (Witt-IPC)
W76-12487

FIRST CLOSED-CYCLE KRAFT MILL,
L. Haas.
Pulp and Paper International, Vol. 18, No. 6, p 35-36, 53, June, 1976. 1 fig, 1 illus.

Descriptors: *Pollution abatement, *Pulp wastes, *Bleaching wastes, Water pollution sources, Wastes, Industrial wastes, Operating costs, Water consumption(Except consumptive use), Pulp and paper industry, Salts, Sodium chloride, *Recycling, Waste treatment, *Waste water treatment, Costs, *Water reuse.
Identifiers: *Kraft mills, Closed-cycle systems, Great Lakes Paper Co.(Canada), Rapson-Reeve salt recovery process, Chemical recovery, Energy conservation.

Great Lakes Paper Company is adding a new 225,000 metric ton/year bleached kraft mill to its existing facilities at Thunder Bay, Ontario. It will feature the first commercial installation of the Rapson-Reeve salt recovery process, in which NaCl is removed from the black liquor cycle. The recovered salt is used in the regeneration of bleaching chemicals. Complete recycling of pulping and bleaching process wastes will eliminate the effluent treatment plant and reduce water and energy consumption and operating cost. A brief description and flow diagram of the salt recovery process are given. (Witt-IPC)
W76-12488

SWISS MILL IS TRYING WET AIR OXIDATION TO GET RID OF SLUDGE AND RECOVER FILLER,
Zimpro Inc., Rothschild, Wis.
B. L. Flynn, Jr.
Paper Trade Journal, Vol. 160, No 9, p 23-24, May 1, 1976. 3 fig.

Descriptors: *Sludge treatment, *Pulp wastes, *Oxidation, Pulp and paper industry, Pigments, Clays, Waste treatment, Water pollution sources, Wastes, Industrial wastes, Carbon dioxide, Inorganic compounds, Water, Europe, Wisconsin, Foreign countries, Treatment facilities, Kaolinites, Titanium, Air, Aeration.
Identifiers: Kaolin, Titanium dioxide, Fillers, Chemical recovery, *Switzerland, *Wet air oxidation.

In 1977, Papierfabrik Biberist (Switzerland), a fine-papers mill, will start up the world's first commercial unit for the recovery of filler clay and pigment from paper mill sludge by wet air oxidation. In the system, built by Zimpro Inc., raw sludge at a concentration between 7 and 8% will be pumped to the oxidation unit at a pressure of 2500 psig. A multistage reciprocating air compressor will supply air at the same pressure, and the sludge and air mixture will be taken into the pressure vessel through heat exchangers. Almost 90% of the organic material in the sludge is oxidized in the reactor to carbon dioxide and water. The rest is solubilized. Oxidized products are drawn off through the process heat exchanger and cooled. The insoluble organic material is removed from the sludge, leaving behind the inorganic materials, primarily kaolin and titanium dioxide. (Sykes-IPC)
W76-12489

MONADNOCK CLEANS UP: SPECIALTY PAPER MILL INSTALLS $1-MILLION WASTE TREATMENT SYSTEM.
Paper Trade Journal, Vol. 160, No. 9, p 28-29, May 1, 1976. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water purification, Suspended solids, Biochemical demand, Aerated lagoons, Aeration, Settling basins, Tertiary treatment, Water quality control, Water pollution control, Waste treatment, *New Hampshire.
Identifiers: Dorr-Oliver Clariflocculator, Contoocook River(NH).

Waste treatment at Monadnock Paper Mills Inc., Bennington, New Hampshire, which produces about 80 tons/day of graphic arts and technical papers, includes primary chemical-physical clarification, secondary biochemical treatment, and tertiary clarification. Effluent is pumped from the treatment plant's surge chests to the primary treatment system consisting of a Dorr-Oliver Clariflocculator equipped with a center drive sludge rake assembly and skimmer. Almost all of the settleable solids and about 94% of the total suspended solids, as well as approximately 30% of the BOD, are removed in the clarifier. The overflow from the clarifier is gravity-fed either in series or in parallel through two identical 2,500,000 gallon aeration ponds. After secondary treatment the effluent flows by gravity to a tertiary system consisting of two 1,500,000 gallon settling ponds. The effluent is mixed with air to ensure complete saturation with oxygen before being discharged into the Contoocook River. Since this facility began operating in July 1974, the mill has surpassed 1978 Environmental Protection Agency requirements. (Sykes-IPC)
W76-12490

CONTAINER CORP. BOXBOARD PLANT INSTALLS CLARIFICATION, SLUDGE RECYCLING SYSTEM.
Paper Trade Journal, Vol. 160, No. 8, p 54, April 15, 1976.

Descriptors: *Activated sludge, *Waste water treatment, *Treatment facilities, *Pulp wastes, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Florida, Water purification, Sludge treatment, Dewatering, Incineration, Waste disposal, Equipment.
Identifiers: *Board mills, Dorr-Oliver clarifier, Unox process, Dorr-Oliver RSR(Rapid sludge removal) clariflocculator, Emmerson-Jones filter press.

The activated sludge system installed by Container Corporation of America (Fernandian Beach, Florida) is capable of handling over 25,000,000 gal/day of combined process waste streams. The combined plant wastes are initially processed in a 250-ft diameter Dorr-Oliver primary clarifier. Primary clarifier effluent is fed to a Union Carbide 'Unox' oxygen dissolution system, a three-bay structure with a capacity of about 2,500,000 gallons. Mixed liquor goes to two Dorr-Oliver RSR Clariflocculators, each of which features a flocculator influent well. The influent well promotes floculation and increases the settling rate and detention efficiency. The underwater parts of both clarifiers are designed with standard RSR (rapid sludge removal) configuration. Rake arms are equipped with sludge uptake pipes and alternate rate and deflector blades. Waste sludge from the clarifiers is dewatered on two Emmerson-Jones filter presses. Sludge cake is metered to bark burners for disposal. (Sykes-IPC)
W76-12491

PAPER MILL WASTE SLUDGE OXIDATION AND PRODUCT RECOVERY,
Sterling Drug, Inc., New York. (Assignee).
C. A. Hoffman.
United States Patent No. 3,876,497. April 8, 1975, 4 p. 2 fig, 2 claims.

Descriptors: *Pulp wastes, Sludge, *Oxidation, Inorganic compounds, Wastes, Industrial wastes, Water pollution sources, Clays, Dewatering, *Sludge treatment, Heat treatment, Pigments, Titanium, *Patents.
Identifiers: Paper fillers, Titanium dioxide, *Sludge oxidation.

A process for rescovering inorganic papermaking fillers (titanium dioxide and clay) from paper mill waste sludge comprises heating the sludge with an oxygen-containing gas at 160-375C and 500-3500 lb/sq inch, so that most of the water content of the sludge remains in the liquid phase, for 0.25-5.0 hr; separating the gas, liquid, and osolid phases; and washing and dewatering the solids to provide recovered filler suitable for reuse in the papermaking process. (Lynch-IPC)
W76-12493

METHOD FOR TREATING HEMI CAUSTIC EFFLUENTS,
ITT Industries, Inc., New York.
J. D. Wilson, A. Beelik, H. L. Hergert, and R. L. Mitchell.
Canadian Patent No. 976,703. October 28, 1975, 18 p. 7 tab, 6 claims.

Descriptors: *Waste water treatment, *Carbohydrates, *Pulp wastes, *Bleaching wastes, Degradation(Decomposition), Heat treatment, Waste treatment, Water pollution treatment, Wastes, Industrial wastes, Effluents, *Patents, *Cellulose.
Identifiers: *Hemicelluloses, Sodium hydroxide, Alkaline extraction(Bleaching), Chemical recovery.

A process is provided for treating the effluent from cold caustic extraction of cellulose pulp, containing 0.5-3.0% hemicellulose and 4-24% NaOH, so as to recover the NaOH for reuse. The process consists of heating the effluent to a temperature of 175-240C for a period time sufficient to cause thermal degradation of hemicelluloses in the effluent and then employing the effluent still containing the degraded hemicelluloses as a source of NaOH in subsequent pulp processing. The degradation of the hemicelluloses prevents their deposition on the cellulosic material during such reuse. (Lynch-IPC)
W76-12495

WASTE TREATMENT SYSTEM,
Kimberly-Clark Corp., Neenah, Wis.
M. G. Mandt.
Canadian Patent No. 968,890. June 3, 1975, 16 p. 5 fig, 7 claims.

Descriptors: *Waste water treatment, *Pulp wastes, *Biological treatment, Equipment, *Biochemical oxygen demand, *Suspended solids, Activated sludge, Waste treatment, Sludge, Oxygen, Water pollution treatment, Circulation, Aerobic treatment, Aeration, Treatment facilities, *Patents.

A method of treating a sewage-containing liquid, such as paper industry waste waters, to reduce BOD and suspended solids content comprises the following steps: (1) causing the liquid to move circuitously so that the sewage describes a generally circular and spiral path, (2) introducing an oxygen-rich gas and activated sludge into the liquid, (3) passing a portion of the sewage into a central clarifying zone, (4) allowing the sludge to settle within the clarifying zone so as to leave the liquid above the sludge substantially free of suspended solids, (5) removing the clarified liquid from above the sludge, and (6) returning at least a portion of the settled sludge to the circuitously moving liquid. The result is a high-capacity waste treatment facility that is extremely compact and yet capable of reducing both BOD and suspended solids by 90% or more. (Lynch-IPC)
W76-12496

PROCESS FOR TREATING WASTE WATERS FROM ALKALINE PULPING (PROCEDES DE TRAITEMENT DES EAUX RESIDUELLES DE FABRICATION DES PATES DE CELLULOSE PAR DES METHODES ALCALINES),
A. Vian Ortuno, and J. Rodriguez Jimenez.
French Patent No. 2,169,835. September 14, 1973, 8 p. 10 claims.

Descriptors: *Waste water treatment, *Pulp wastes, *Chemical precipitation, *Coagulation, Organic compounds, Waste treatment, Color, Oxidation, Neutralization, Mixing, Acids, Hydrogen ion concentration, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, *Patents.
Identifiers: *Black liquors, Kraft mills.

A process for treating dilute black liquors from alkaline pulping involves mixing them with enough strong acid to lower their pH to below 6.5, thus precipitating nearly all of the nonbiodegradable organic material via coagulation. This material is then separated from the liquid. The liquid is then subjected to complementary treatment involving sorptive decoloration, atmospheric oxidation, and neutralization to meet discharge requirements. (Speckhard-IPC)
W76-12497

IMPROVEMENTS TO PROCESSES FOR PURIFYING EFFLUENTS ORIGINATING FROM THE MANUFACTURE AND BLEACHING OF CHEMICAL OR SEMICHEMICAL PAPERMAKING PULPS (PERFECTIONNEMENT AUX PROCEDES D'EPURATION DES EFFLUENTS PROVENANT DE LA FABRICATION ET DU BLANCHIMENT DES PATES A PAPIER DITES CHIMIQUES OU SEMI-CHIMIQUES),
J. Bebin, P. Boulenger, and J.-C. Bourdelot.
French Patent No. 2,159,560. June 22, 1973, 11 p. 2 fig, 2 tab, 5 claims.

Descriptors: *Waste water treatment, *Pulp wastes, *Bleaching wastes, *Chemical precipitation, *Flocculation, Waste treatment, Separation techniques, Hydrogen ion concentration, Water purification, Water pollution treatment, Wastes, Industrial wastes, Aluminum, *Patents.
Identifiers: *Aluminum sulfate.

A process for purifying pulp mill waste waters and bleach plant effluents is claimed, in which part of the nonbiodegradable materials present in the process water are precipitated in a primary stage by adddition of excess aluminum sulfate. The solution obtained after separation of the precipitate is subjected in a second stage to flocculation by the excess aluminum sulfate remaining in solution, with adjustment of pH to about 5.4. The precipitates and flocculant material formed in the two stages are separated and treated to allow the recovery of aluminum sulfate. (Sykes-IPC)
W76-12498

AEROBIC LAGOON WASTE TREATMENT AND METHOD,
Kimberly-Clark Corp., Neenah, Wis. (Assignee).
A. R. Le Compte, Jr., and D. W. Appel.
United States Patent No. 3,893,924. July 8, 1975, 9 p. 5 fig, 6 claims.

Descriptors: *Aerated lagoons, *Waste water treatment, *Pulp wastes, Circulation, Jets, Suspended solids, Electric power demand, Aeration, Waste treatment, Water pollution treatment, Wastes, Industrial wastes, Aerobic treatment, *Patents, Oxidation lagoons.

A system for treating liquids containing waste materials, such as paper mill effluents, includes a basin or lagoon which is operated aerobically by the use of jets arranged so as to set up cells of complementary primary circulation with resulting secondary circulation patterns sufficient to prevent solids from settling out, except when desired in a settling zone. Power requirements are reduced as compared to those of conventional surface-aerated or diffuser-aerated lagoons equipped to operate aerobically. (Lynch-IPC)
W76-12499

PROCESS FOR TREATMENT OF PAPER PULP-CONTAINING EFFLUENTS (VERFAHREN ZUR BEHANDLUNG VON PAPIERBREIHALTIGEN ABFALLFLUESSIGKEITEN),
Nippon Carbon Co. Ltd., Tokyo.
M. Nakajima, and K. Kuwabara.
German Patent (Offenlegungsschrift) No. 2,505,744. September 25, 1975, 17 p. 4 tab, 4 claims.

Descriptors: *Pulp wastes, *Waste water treatment, *Flocculation, *Chemical precipitation, Waste treatment, Water pollution sources, Water pollution treatment, *Patents.
Identifiers: *Dicyandiamide-formaldehyde resins, *Aluminum sulfate.

This process for paper mill effluent treatment is based on the use of dicyandiamide-formaldehyde resin as a flocculant in amounts of 1-50 weight parts per 100 weight parts of turbid substances. Addition of the flocculant is followed by addition of aluminum sulfate. (Speckhard-IPC)
W76-12501

PROCESS FOR SEPARATING CELLULOSE FROM WASTE WATER (VERFAHREN ZUR BEFREIUNG VON ZELLULOSE AUS ABWAESSERN),
Mo Och Domsjo A.B., Ornskoldsvik (Sweden).
H. O. Samuelson.
German Patent (Offenlegungsschrift) No. 2,501,719, July 31, 1975, 38 p. 2 fig, 20 claims.

Descriptors: *Bleaching wastes, *Pulp wastes, *Waste water treatment, *Anion exchange, Organic compounds, *Sorption, *Polymers, Sulfates, Chlorides, Ions, Effluents, Organic acids, Chlorination, Aromatic compounds, Alkalis(Bases), Resins, *Cellulose, Waste treatment, Wastes, Industrial wastes, Water pollution treatment, Ion exchange, Oxygen, *Patents.
Identifiers: Alkaline extraction, Oxygen bleaching, Chlorine dioxide.

A process is claimed for separating organic substances from pulp mill effluents through sorption on water-insoluble polymers (preferably crosslinked polymers) and for recovering these substances. The process is characterized in that a portion of the effluent with a low content of inorganic anions, such as sulfate and chloride ions (e.g., the effluent from an alkaline extraction stage or an oxygen bleaching stage), is brought into contact with one or more organic anion exchangers to remove all organic acids or anions and to adsorb organic nonelectrolytes while another portion of the effluent (preferably with a high chloride content, such as the effluent from chlorination or chlorine dioxide bleaching), is brought into contact with an adsorbing resin with a structure such that aromatic compounds are adsorbed while the chloride ions remain in solution. Following the sorption stage, the anion exchanger is regenerated with a solution containing active alkali, the solution being additionally used, wholly or partly and preferably following regeneration, in the desorption of materials adsorbed by the adsorption resin.(Speckhard-IPC).
W76-12502

APPARATUS, INSTALLATION, AND PROCESS FOR DEWATERING CLARIFIED SLUDGES (VORRICHTUNG, ANORDNUNG UND VERFAHREN ZUR ENTWAESSERUNG VON KLAERSCHLAEMMEN),
Voit, Michael, Fa., Weissenstadt, (West Germany).
K. Voit.
German Patent (Offenlegungsschrift) No. 2,320,494. November 7, 1974, 9 p. 4 fig, 7 claims.

Descriptors: *Sludge treatment, *Dewatering, *Filters, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Screens, Size, Waste treatment, Solid wastes, Sludge, Operation and maintenance, Filtration, Water pollution treatment, Fibers(Plant), *Patents.
Identifiers: *Vacuum drum filters.

A vacuum drum filter for dewatering sludges with a component of fibrous materials (e.g., paper mill sludge) is characterized by the use of a filter drum with a metal screen of relatively coarse mesh (mesh openings larger than the diameter of the fibers in the sludge but smaller than the length of most of the fibers) tightly stretched around the drum periphery. Use of such a screen in place of a relatively fine textile filter material permits uninterrupted operation with the same filtering element over periods of several years while giving a satisfactory filtering effect. (Speckhard-IPC)
W76-12503

PROCESS FOR PRECLEANING INDUSTRIAL WASTE WATER RESULTING FROM THE PROCESSING OF WATER-SOLUBLE PHENOLIC RESINS OR UREA-FORMALDEHYDE RESIN SOLUTIONS (VERFAHREN ZUR VORREINIGUNG VON BEI DER VERARBEITUNG VON WASSERLOESLICHEN PHENOLISCHEN RESOLEN ODER VON HARNSTOFF-FORMALDEHYDHARZLOESUNGEN ANFALLENDEM INDUSTRIEABWASSER),
V. Polinek.
German Patent (Offenlegungsschrift) No. 2,335,327. July 18, 1974, 11 p. 5 claims.

Descriptors: *Waste water treatment, *Chemical precipitation, *Phenols, Hydrogen ion concentration, Sedimentation, Polyelectrolytes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Binders, *Patents, *Resins.
Identifiers: Plywood, Wood particle board, Urea-formaldehyde resins, Aluminum sulfate, Aluminum chloride, *Phenolic resins.

A process for pretreatment of effluents from particle board or plywood plants to remove phenolic or urea-formaldehyde resins involves (1) precipitation in a neutral or weakly acidic medium using aluminum sulfate and/or aluminum chloride solutions -- acidified (if necessary) through the addition of inorganic acids; (2) accelerating the sedimentation of the resulting precipitate through addition of synthetic polyelectrolytes, and (3) separating off and recycling the sedimented precipitate. (Speckhard-IPC)
W76-12504

PROCESS FOR PURIFYING PAPERMAKING EFFLUENTS (VERFAHREN ZUR REINIGUNG VON BEI DER PAPIERHERSTELLUNG ANFALLENDEM ABWASSER),
Akzo N.V., Wuppertal (West Germany).
L. O. Barkman.
German Patent (Offenlegungsschrift) No. 2,529,861. January 29, 1976, 12 p. 1 fig, 1 tab, 1 claim.

Descriptors: *Waste water treatment, *Pulp wastes, *Flocculation, *Filtration, *Centrifugation, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Fibers(Plant), Clays, Sands, Chemicals, Plastics, Films, *Patens.
Identifiers: Waste paper treatment.

A process for purifying effluent from paper machines (especially papermaking involving the reuse of waste paper stock) involves addition of a flocculant, removal of fibrous components from the effluent, addition of a filtration aid, and removal of the remaining solids in the effluent via filtration or centrifugation. In particular, the filtra-

tion aid is the material separated from the pulp prior to papermaking (generally a mixture of waste paper impurities including heavy particles such as sand, clay, and other substances serving as fillers as well as bits of plastic film). (Lynch-IPC)
W76-12505

EFFLUENT TREATMENT PROCESS (ABWASSERAUFBEREITUNGSVERFAHREN),
Hitachi Ltd. (Japan).
T. Kobayashi, M. Yuasa, and M. Itoh.
German Patent (Offenlegungsschrift) No. 2,344,587. April 18, 1974, 23 p. 1 fig, 3 tab, 3 claims.

Descriptors: *Waste water treatment, *Wood wastes, *Suspended solids, *Adsorption, Waste treatment, Water pollution sources, Heavy metals, Dyes, Detergents, Sawdust, Farm wastes, Water pollution treatment, Water pollution control, Industrial wastes, *Patents, *Biological treatment, Mixing.

A process for biological treatment of industrial effluents includes mixing the effluent with fully developed tissue cells of seed plants (e.g., sawdust, comminuted wood, or agricultural waste). Substances such as heavy metals, dyes, and detergents are effectively adsorbed by the tissue cells and are separated from the waste water when the tissue cells are removed. (Speckhard-IPC)
W76-12506

PROCESS FOR PURIFYING INDUSTRIAL EFFLUENTS (VERFAHREN ZUR REINIGUNG VON INDUSTRIELLEN ABWAESSERN),
CIBA-GEIGY Ltd., Basel (Switzerland).
H. Wegmuller, and J. Haase.
German Patent (Offenlegungsschrift) No. 2,365,559. July 10, 1975, 35 p. 10 claims.

Descriptors: *Waste water treatment, *Pulp wastes, *Adsorption, *Color, Wastes, Industrial wastes, Textiles, Dyes, Water purification, Water pollution treatment, *Solid contact processes, Sorption, *Cellulose, Waste treatment, *Patents, Polymers.
Identifiers: Leather, Waste paper, Aminoplast resins, Adsorbents, *Decoloring.

A process for purifying (especially decoloring) industrial effluents (e.g., from the textile, paper, leather, or dyeing industries) involves contacting the waste water with a cellulosic adsorbent material (pulp, waste paper) pretreated with a basic polymeric precipitating agent (e.g., a water-soluble basic aminoplast). (Speckhard-IPC)
W76-12507

ON THE MECHANISM OF GAMMA-RADIOLYSIS OF EFFLUENTS (K MEKHANIZMU GAMMA-RADIOLIZA STOCHNYKH VOD),
Belorussian State Univ., Minsk (USSR).
L. V. Dyubchenko, A. M. Kovalevskaya, V. D. Maiboroda,, E. P. Petryaev, and V. G. Shlyk.
Vestsi Akademii Navuk Belaruskai SSR, Seriya Fizika-Energetychnykh Navuk, No. 4, p 38-41, 1974. 1 fig, 10 ref.

Descriptors: *Radiation, *Gamma rays, Effluents, Oxygen, Oxidation, Water pollution sources, Wastes, Industrial wastes, *Waste water treatment, Water pollution treatment, *Radiation, *Irradiation.
Identifiers: *Black liquors, Hydrogen peroxide, *Radiolysis.

Redistilled water saturated with air and kraft black liquor diluted with 500 volumes of water saturated with air were irradiated with gamma-rays (from Cs-137) at a rate of 65 + or - 1 rad/sec. In the course of irradiation (up to 20 min) determinations were made of the concentration of dissolved oxygen and hydrogen peroxide. For pure water, the radiation yield (positive) of hydrogen peroxide was 1.1 and oxygen (negative) 0.5. For black liquor, the corresponding values were zero and 1.3. The relatively low oxygen radiation yield can be explained by a low rate of oxidation in the system, while the absence of hydrogen peroxide is due either to its reaction with radicals in the solution or its consumption for oxidation of dissolved substances. The experimental radiation yield values are in agreement with values calculated on the basis of generally accepted mechanism of water radiolysis. The high oxygen yield value (3.3) reported for water by Compton in Isotopes and Radiation Technology, Vol. 8, p 453 (1971), close to that obtained by him for an effluent (3.5), was apparently due to the presence of impurities acting as acceptors. The range of oxygen yields, from 1.3 (found in diluted black liquor) to 3.5 (reported by Compton), indicates that the oxygen consumption depends on the nature of polluting substances dissolved in water. (Stapinski-IPC)
W76-12508

CONSTRUCTION AND OPERATION OF HIGH-PRESSURE FILTERS WITH MOLECULAR SIEVES (BUDOWA I DZIALANIE WYSOKOCISNIENIOWYCH FILTROW Z SITAMI MOLEKULARNYMI),
Technical Univ., Lodz (Poland). Inst. of Papermaking and Paper Machinery.
T. Tyralski.
Przeglad Papierniczy, Vol. 32, No. 4, p 132-136, April, 1976. 6 fig, 18 ref.

Descriptors: *Reverse osmosis, *Waste water treatment, *Pulp wastes, Membranes, *Construction, *Operation and maintenance, Pulp and paper industry, Sulfite liquors, *Membrane processes, Separation techniques, Water pollution treatment, Water pollution control, Water pollution source, Toxicity, Waste treatment, *Sieves, *Filters.
Identifiers: Closed systems.

The process of reverse osmosis is discussed, including the general principles of this technique, the types of membranes used (homogeneous and heterogeneous) and their preparation, the classification and construction of reverse osmosis equipment, and the applications of the technique in the pulp and paper industry (e.g., removal of solubles from dilute sulfite pulping effluents, and concentration of difficult to oxidize and toxic substances). It is pointed out that reverse osmosis filters may play an important role in achieving closed water cycles at pulp and paper mills. (Stapinski-IPC)
W76-12509

MODERNIZED OPERATION OF (EFFLUENT) PURIFICATION EQUIPMENT (SOVERSHENSTVOVAT' RABOTU OCHISTNYKH SOORUZHENII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidroliznoi Promyshlennosti, Moscow (USSR).
L. I. Bryzgalov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 2, p 6-7, 1976. 2 tab.

Descriptors: *Treatment facilities, *Waste water treatment, *Operation and maintenance, Filters, Filtration, Sedimentation, *Biological treatment, Aerated lagoons, Biochemical oxygen demand, Suspended solids, Leakage, Overflow, *Yeasts, Water pollution sources, Water pollution control, Waste treatment, Wastes, Industrial wastes, Hydrolysis, Effluents, *Fermentation.
Identifiers: USSR.

The effluents of fermentation plants and yeast-producing factories are first purified mechanically in sand filters and radial sedimentation tanks, then subjected to biological purification in aeration tanks or on biological filters. The 5-day BOD of purified effluents is 0.18-1.26 kg/cu m, their content of suspended solids 0.05-0.26 kg/cu m. In most plants, existing purification equipment needs to be expanded and modernized. This should be done by 1980. In the meantime, however, the purification efficiency can be substantially increased by reducing the degree of pollution of the effluents and by improving equipment operation. Thus, pollution can be reduced by controlling losses through leaks and overflow, and by the introduction of biological oxidation in air-float yeast-growing tanks. The operation of the equipment can be improved by better control of various stages of the process and by adequate maintenance. These methods and measures are described and their effects in terms of reduced pollution and higher effluent purification are estimated. (Stapinski-IPC)
W76-12511

COST FUNCTIONS FOR WASTEWATER CONVEYANCE SYSTEMS,
Louvain Univ. (Belgium). Groupe de Travail en Economie de l'Environnement.
D. Tyteca.
Journal of the Water Pollution Control Federation, Vol. 48, No. 9, p 2120-2130, September 1976. 5 fig, 1 tab, 20 ref.

Descriptors: *Waste water(Pollution), *Water pollution control, Water quality, Economics, *Optimization, *Costs, Mathematical models, Equations, *Regional analysis, *Waste water treatment, Constraints, Hydraulics, Flow, Pipes, Pressure, Gravity, Planning, Numerical analysis, Regression analysis, Linear programming, Systems analysis, Sewers.
Identifiers: *Cost minimization, Nonlinear programming, *Waste water conveyance.

Waste water transportation cost functions are important in regional minimum-cost water-quality control models. These cost functions are elaborated, in a Belgian study, beginning with a description of the installations to be provided and their cost. Hydraulic relationships are obtained in order to derive more useful forms of the total cost. A preoptimization study is conducted to express the cost as a function of the flow. The flow is the decision variable in the regional models, and the cost equations must be clear of the diameter of the pipe. After numerical examples, the applicability of the analysis to larger contexts is discussed, and the role of the cost function as a component of the regional models is recalled. Results indicate that the cost functions of waste water conveyance and treatment are concave--the greater quantities of waste water transported or treated cost less than smaller ones. (Bell-Cornell)
W76-12513

OPTIMIZING FLOCCULATOR POWER INPUT,
Environmental Protection Agency, San Juan, Puerto Rico.
R. Andreu-Villegas, and R. D. Letterman.
Journal of the Environmental Engineering Division, Proceedings of the Society of Civil Engineers, Vol 102, No EE2, p 251-263, April 1976. 10 fig, 2 tab, 9 ref.

Descriptors: *Environmental engineering, *Flocculation, *Sewage treatment, Water treatment, *Mixing, Coagulation, Sedimentation, Water quality control, *Waste water treatment.

The effect of the intensity and duration of the mixing used during and immediately following coagulant addition (initial mixing), the mixing intensity used for flocculation, the alum coagulant dose, and the length of the flocculation period on residual turbidity after sedimentation were studied using a laboratory jar test-type procedure. For a given flocculation period, T, there is an optimum G value, G*, corresponding to a minimum residual turbidity. The use of G* optimizes the power input to the flocculation basin. The product (G*)2.8T, in which G is in sec-1 and T is in minutes is equal to 490,000, 190,000 and 70,000 for alum doses of 10, 25, and 50 mg/l respectively. The product (G*)2.8T is not a function of the initial mix conditions. The

minimum residual turbidity decreases as the flocculation period T increases; however, the rate of decrease diminishes after a flocculation period of approximately twenty minutes. (Bell-Cornell)
W76-12525

QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL IMPACT,
Parsons (Ralph M.) Co., Pasadena, Calif. Systems Div.
For primary bibliographic entry see Field 6G.
W76-12528

POLLUTIONAL ANALYSIS OF COMBINED SEWER SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
O. G. Lindholm.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE2, p 301-312, April 1976. 9 fig, 1 tab, 29 ref.

Descriptors: *Water pollution, *Combined sewers, *Environmental engineering, *Storm water, Basins, Retention, Storage tanks, Mathematical models, Storm surge, Runoff, Biochemical oxygen demand, Simulation analysis, Systems analysis, Networks, *Waste water treatment, Treatment facilities.
Identifiers: Receiving water.

Mathematical models for sewer networks and wastewater treatment plants have been used to simulate the BOD levels at different points in the treatment works and to combine sewer overflows under different conditions. The network and the treatment plant were simulated as a unit during an entire year's varying precipitation. Stormwater retention basins proved to be beneficial in reducing total pollution load discharged to the receiving waters only when the degree of pollution in stormwater runoff exceeded a specific limit. However, the effect of a retention basin increased considerably when the storm overflows and the basin outlet flows were set to an optimum setting, and when the size of the secondary clarifier was compatible with the retention basin. The simulations showed that retention basins could have an adverse effect on the discharge of BOD to the receiving water if the amount of BOD is removed by the storm overflow anyway. (Bell-Cornell)
W76-12530

INFLUENCE OF SPECIAL CONSTRUCTIONS IN REGIONAL WASTE WATER SYSTEMS AND THEIR ROLE IN MATHEMATICAL MODELS FOR PLANNING.
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
H. Orth.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D. C., 1974, Volume II, p 36-42. 3 fig, 8 ref.

Descriptors: *Waste water(Pollution), *Treatment facilities, *Planing, *Regional development, *Optimization, Methodology, Mathematical models, Pipes, Constraints, Systems analysis, Economics, *Waste water treatment.
Identifiers: Cost minimization, Storm water outlets, Binary optimization.

Regional waste water systems become viable solutions to the problems of waste water management, where we are forced to remove waste water over larger distances because the receiving water situation at the place of origin poses difficulties with the increasing sewage flow. Closely connected with this problem is the claim for higher efficiency and reliability of the sewage treatment plants. This requires both a complicated technology and highly qualified operators, requirements which can usually be realized only at the larger treatment plants. From this there frequently follows an economical profit in the construction and operating of a large system. This article discusses mathematical models as an instrument for planning and deals with the dimensioning of special constructions and their consideration by means of the binary optimization technique. (See also W76-12535) (Bell-Cornell)
W76-12545

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY'S STORM WATER MANAGEMENT MODEL,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5G.
W76-12549

THE SOLUTION OF THE REGIONALIZATION PROBLEM BY CERTAIN BRANCH-AND-BOUND METHODS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlegen und Wasserversorgung.
W. Ahrens.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 100-111. 4 fig, 3 tab, 15 ref, 1 appen.

Descriptors: *Waste water treatment, *Planning, *Regional development, *Community development, *Optimization, *Treatment facilities, Economics, Design, Construction costs, Operating costs, Constraints, Computers, Algorithms, Equations, Mathematical models, Systems analysis.
Identifiers: *Waste water collection, *Branch-and-bound methods, *Linear binary optimization, Cost minimization, Sewerage systems, Computation time, Computer storage.

The need for planning the process of regional and intercommunity waste water collection and treatment systems is increasing continually in importance with regard to communities, regional water authorities, and civil engineers. Increasing costs oblige the community and design engineer to apply rational methodology for the technical conception as well as for financing. This work presents a computation scheme which allows a determination of the most economical locations of treatment plants and the interconnecting sewerage system so that the regional costs are minimized. The optimal solution is found considering implicitly all possible technical alternatives to a waste water association. Proceeding from a mathematical model which describes the optimization problem, the transformation into a linear binary optimization problem is shown. This problem is more easily solved with certain algorithms than the original non-linear problem. The binary model allows the designer to consider several parameters and thus system components. (See also W76-12535)
W76-12552

THE DISPOSAL OF WASTES INTO THE SEA OF THE PROVINCE OF ROME (ITALY), (IN ITALIAN),
For primary bibliographic entry see Field 5E.
W76-12570

REPORT OF THE QU'APPELLE BASIN STUDY BOARD.
Saskatchewan Quappelle Basin Study Board, Regina.
For primary bibliographic entry see Field 5G.
W76-12587

WATER QUALITY OBJECTIVES.
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
For primary bibliographic entry see Field 5G.
W76-12588

AVERAGE RISE OF EPA PLANT, SEWER INDEXES SLOWS.
Engineering News Record, Vol. 196, No. 26, p 112, June 24, 1976. 3 tab.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Sewers, *Cost trends, Federal government, Cities, Average costs.
Identifiers: Cost indexes.

Sewer and plant cost indexes compiled by the Federal Environmental protection Agency (EPA) rose from 1% to nearly 3% during the second quarter of 1976. However, the average increase rate for the series of three indexes during this period dropped slightly below the average increase rate for the previous quarter. City indexes for hypothetical facilities were determined for 25 cities. The average for a five-mgd plant increased 1.1% from the first-quarter average; that for a fifty-mgd plant increased 1.8%, and that for complete urban sewer systems increased 2.9%. The increase rates dropped from a first quarter average of 2.7% for a 5-mgd plant and from 2.6% for a 50-mgd plant, but increased from 2% for the sewer system. The 5-mgd hypothetical plant include a bar screen, grit chamber primary clarification, conventional activated sludge, chlorination, gravity thickening and vacuum filtration. The 50-mgd plant include these plus lime clarification and multimedia gravity filtration as well as multiple hearth incineration. Labor considerations in the cost index for the sewer system include common laborers, cement finishers, carpenters, and medium equipment operators. Fringe benefits are included in labor rates. Concrete is ready-mix; pipe is reinforced concrete 24 in. in diameter, lumber is lowest grade, and asphat is assumed to be paving asphalt. Second-quarter averages for old sewage treatment plant and sewer construction cost indexes were 257.8 and 269.7, respectively, up 4.8% and 5.5% respectively, from June 1975. (Snyder-FIRL)
W76-12598

APPARATUS AND PROCESS FOR PRODUCING AN ORGANIC PRODUCT FROM SEWAGE SLUDGE,
Q. L. Hampton.
United States Patent 3,963,471. Issued June 15, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 3, p 1223-1224, June, 1976. 1 fig.

Descriptors: *Patents, *Sewage sludge, *Organic compounds, *Sludge treatment, *Byproducts, *Waste treatment, Coagulation, Flocculation, Separation techniques, Dewatering, Temperature, *Recycling.

A patent for a process which produces an organic product from sewage sludge is described. The process consists of the following steps: mixing a predetermined quantity of liquid waste sewage sludge with chemicals for coagulating or flocculating the solids contained in the liquid sludge, subjecting the mixture to pressure for the extraction of a portion of the moisture, draining off the extracted moisture, heat drying and pelletizing the detwatered material to produce pellets, subjecting the dry pelletized material to a suction action in order to separate dust and fine particles from the pellets, and discharging the separated pellets by gravity to a storage location. In addition, a portion of the pellets produced are mixed with the dewatered material for drying and preheating prior to the heat drying and pelletizing stages so that the drying temperatures can be selected low enough to prevent formation of clinkers and the ignition of organic material. (Kreager-FIRL)
W76-12600

PROCESS FOR TREATING DECOMPOSABLE ORGANIC WASTE MATERIALS,
L. A. Haug.

United States Patent 3,963,470. Issued June 15, 1976. Official Gazette of the United States Patent Office Vol. 947, No. 3, p 1223, June, 1976.

Descriptors: *Patents, *Sewage sludge, *Organic compounds, *Sludge treatment, *Byproducts, Aeration, Biological treatment, Absorption, *Decomposing organic matter, *Waste water treatment.

A patent for a process that treats decomposable wet sewage sludge in order to produce a partially dry humus-like material is described. The process involves partially drying a portion of the wet material, spreading this portion in the form of an absorbent pad, mixing an additional quantity of sewage sludge with the first portion in order to produce a mixture having an initial moisture content sufficient for the initiation of aerobic decomposition, and periodically turning the mixture under ambient atmospheric conditions in order to aerate it until decomposition ceases and the mixture is partially dry. The steps of wet material addition and aeration (periodic turning) are successively repeated, and a portion of the partially dry humus-like material is removed from the partially dried mixture at predetermined intervals. (Kreager-FIRL)
W76-12601

IMPROVEMENTS IN AND RELATING TO WASTE WATER TREATMENT,
South African Inventions Development Corp., Pretoria. (Assignee).
J. L. Barnard.
United States Patent 3,964,998. Issued June 22, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 4, p 1722-1723, June, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Activated sludge, *Nitrogen, Organic wastes, Nitrogen compounds, *Denitrification.

A nitrogen removal process for organic waste water containing nitrogenous compounds was patented. Waste water and activated sludge recycled from a subsequent stage are fed to the first biological denitrification stage. Turbulence is induced to mix the activated sludge and waste water, producing a mixed liquor. Heterotrophic bacteria suspended in the activated sludge convert nitrates into nitrogenous gases under anoxic conditions. Mixed liquor from this stage passes to the second stage which is aerated to maintain a dissolved oxygen concentration between 0.2 and approximately 6 mg/liter. Nitrifying activated sludge bacteria biologically nitrigy nitrogenous compounds, producing nitrates. Mixed liquor containing nitrates formed in this stage is recycled to the first stage at a daily average of at least 0.8 times the first stage feed rate, by volume, of waste water. The mixed liquor residence time in the first stage is sufficient to denitrify 80% by weight or more of the recycled nitrates. Mixed liquor is passed from the nitrification stage to another stage where turbulence is induced, and mixed liquor residence time is sufficient for endogenous bacterial respiration to reduce oxygen and then convert 60% by weight or more of the nitrates to nitrogen gas. Mixed liquor is then passed to a solids separation stage to produce an activated sludge with a concentrated bacteria suspension and a clarified effluent. Clarified effluent is withdrawn from the separation stage. (Snyder-FIRL)
W76-12603

APPARATUS FOR BIOLOGICAL PURIFICATION OF AN EFFLUENT,
J. R. Kaelin.
United States Patent 3,965,009. Issued June 22, 1976. Official Gazette of the United States Patent Office, Vol. 947, No. 4, p 1726, June, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Activated sludge, *Treatment facilities, Effluents, Equipment, Basins.

An apparatus was patented for biologically purifying an effluent. It includes two identical basins which are sealed gas-tight at their top portion and have a common wall. This common wall has through passages interconnecting the basins. The effluent being purified is fed alternately to each basin. The purified water is then discharged alternately from each basin. When the concentration of activated sludge in one basin falls below a specified level, the operation changes direction; the other basin serves as the activated sludge basin and the first basin serves as a final purification basin. An aeration impeller is provided for enriching the effluent with oxygen or a mixture containing oxygen and for agitating the effluent in the basin functioning as the activated sludge basin. The impeller is double-sided and has a supply line for oxygen that extends into one of its intake openings. A slide that is vertically movable is provided in the upper part of the common wall to open and close a passage in its upper end. Rails and rollers are provided to reciprocally support the aeration impeller on the basins and to slidably move the aeration impeller through the movable passage between the basins. Excess oxygen is removed from the upper part of the basins. (Snyder-FIRL)
W76-12604

SEWER LAYING SYSTEM,
For primary bibliographic entry see Field 8B.
W76-12605

LIVING FILTER PERKS UP REGIONAL SYSTEM,
Keifer Associates, Inc., Chicago, Ill. Western Michigan Office.
R. L. Lappo.
Water and Wastes Engineering, Vol. 13, No. 6, p 18-22, 33, 44, June, 1976. 2 fig, 3 tab.

Descriptors: *Irrigation, *Waste water treatment, *Water reuse, *Symbiosis, Domestic wastes, Industrial wastes, Oxidation lagoons, Biological treatment, Aeration, Chlorination, Treatment facilities, Michigan, Regional development, Soil filters, *Filtration.
Identifiers: *Muskegon County(Mich), *Soil filtration.

An irrigation system for treating waste water from 13 cities and towns and five major industries in Muskegon County, Michigan is described. Raw waste water is pumped 11 miles through a 66-inch reinforced concrete force main to a waste water treatment facility. The raw sewage is intensively oxygenated for three days by mechanical aeration and then stored in lagoons that function as oxidation and settling ponds. Effluent ready for irrigation is discharged through an outlet lagoon which has a surface area of 14 acres and a working depth of 12 feet. Immediately prior to irrigation, the water passes through a chlorinator for disinfection. Tertiary treatment is obtained by passing the effluent from the lagoon treatment facilities through the aerobic soil zone. The irrigation facilities are designed to apply the annual supply of waste water during a 7-month irrigation season. The daily average influent to the system is 28.5 million gallons/day, with 40% of it being domestic and 60% industrial. (Kreager-FIRL)
W76-12607

MASS TRANSFER LIMITATIONS ON TRICKLING FILTER DESIGN,
California Univ., Davis. Dept. of Civil Engineering.
E. D. Schroeder, and G. Tchobanoglous.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p 771-775, April, 1976. 4 fig, 5 ref.

Descriptors: *Mass transfer, Rates, *Trickling filters, *Oxygen, Performance, *Waste water treatment, Biochemical oxygen demand, *Design criteria, Odor, Kinetics, *Filters, Filtration.
Identifiers: Oxygen transfer rate.

The limiting effect of the oxygen transfer rate on trickling filter performance is discussed. There appears to be no real understanding as to what extent oxygen transfer must be limited before problems occur, and it is not possible to obtain more than a rough estimate of the maximum influent organic concentration using available data. In many areas of the country, there are periods, especially during the summer, when essentially no air flow occurs through trickling filters because temperature differentials are negligible; however, detailed reports on the results of no air flow are not documented in the literature. The maximum applied biochemical oxygen demand concentration determined for trickling filters packed with plastic media is estimated at 400 mg/liter and seems to be appropriate for design purposes, although it is probably a conservative figure. When biochemical oxygen demand concentrations in excess of 500-600 mg/liter are applied, the mass transfer rate of oxygen may become limiting. The probability of odor production will also increase under these conditions. (Kreager-FIRL)
W76-12608

COLESHILL (1): EXPERIMENTING WITH WASTE WATER TREATMENT,
N. Banks.
Water, No. 8, p 20-22, May, 1976.

Descriptors: *Pilot plants, *Treatment facilities, *Tertiary treatment, *Waste water treatment, Equipment, Biological treatment, Flocculation, Activated carbon, Filtration, Aeration, Settling basins, Monitoring, Instrumentation, Programs, Design, *Design criteria.
Identifiers: Physico-chemical treatment, United Kingdom.

The design of an advanced waste water treatment pilot plant in the United Kingdom which was constructed as a result of a study on advanced waste water treatment methods by the Committee on the Challenges of Modern Society is described. The design involves parallel feed streams of waste water piped along both faces of a fixed gantry and mobile treatment units which may be connected in any order to either feed stream. Units dealing with physico-chemical treatment include: chemical flashmixing and flocculation tanks and multimedia and activated carbon filters. There are also acid/alkaline adjustment facilities and a fixed installation for preparing and dosing chemials. Mobile units for conventional biological treatment processes include surface aeration tanks and high-rate biological filters. Five pairs of mobile settling tanks and a fixed installation for sludge treatment are common to both the physico-chemical and biological treatment processes. Plant performance is monitored by portable sensors which transmit data to a central data-logging installation. (See also W76-12610) (Kreager-FIRL)
W76-12609

COLESHILL (2): INCINERATING SEWAGE SLUDGE,
For primary bibliographic entry see Field 5E.
W76-12610

AMMONIA REMOVAL FROM WASTEWATER BY LIGAND EXCHANGE,
National Environmental Research Center, Cincinnati, Ohio.
R. A. Dobbs, S. Uchida, L. M. Smith, and J. M. Cohen.
Adsorption and Ion Exchange, Vol. 152, No. 71, p 157-163, 1975. 7 fig, 4 tab, 11 ref.

Descriptors: *Ion exchange, *Ammonia, *Waste water treatment, *Municipal wastes, Feasibility studies, Evaluation, Performance, Chemical reactions, Phosphates, Sulfates, Alkalinity.
Identifiers: *Ligand exchange.

The technical feasibility of removing ammonia from municipal waste water by a ligand exchange process was demonstrated along with the subsequent regeneration of the exhausted exchanger with low pressure steam. An ion exchanger containing hydrous zirconium oxide was converted to the cupric form for removing ammonia by the mechanism of ligand exchange. Copper bleed during loading was less than one microgram/liter of copper. The pH of the waste water being treated was found to be important since undissociated ammonia rather than ammonium ion was the species involved in the reaction; the optimum pH range was between 10 and 11. The common waste water anions, phosphate and sulfate, did not compete with ammonia at concentrations of 10 and 100 milligrams/liter, respectively; and no exchange in ammonia capacity was observed in the presence of these ions. The exhausted exchanger was readily regenerated by steam at a temperature of 135 C. Additional research is needed to establish the process as an alternative for ammonia removal. (Kreager-FIRL)
W76-12611

COMPACT INCINERATOR FOR SOLID AND LIQUID WASTES.
For primary bibliographic entry see Field 5E.
W76-12612

SEWAGE PLANT UPGRADES EFFLUENT.
Water and Sewage Works, Vol. 123, No. 6, p 72-73, June, 1976.

Descriptors: *Recycling, *Sewage treatment, *Treatment facilities, *Costs, *Water reuse, Filtration, *Effluents, Solid wastes, Equipment, Efficiencies.

The recycling of secondary treatment effluent has significantly improved the efficiency of internal operations at the Metropolitan Denver Sewage Disposal District Number 1 plant near Commerce City, Colorado. A portion of the effluent from the secondary clarifiers is used for several utility functions normally requiring clean tap water. An Adams VWS-16 Automatic Water Strainer is used to remove solids from the secondary treatment effluent prior to recycling. The strainer is equipped with Poroedge tubes with a slot width of 0.010 in and is designed for automatically programmed backwash based on the total pressure drop across the system. During the backwash cycle, the tubes are backwashed sequentially, one tube at a time, and the backwash water is returned to the system input. The recycled water is available at virtually no cost and affords a significant savings over municipal tap water used for the same purpose. (Kreager-FIRL)
W76-12613

SUBMERSIBLE PUMPS UPGRADE SEWAGE HANDLING.
Water and Sewage Works, Vol. 123, No. 6, p 70-71, June, 1976.

Descriptors: *Pumping plants, *Sewage disposal, *Subsurface flow, *Municipal wastes, *Pumps, Equipment, *Waste water treatment, Treatment facilities, Efficiencies, Maintenance, Mechanical equipment, Sanitary engineering, Waste water disposal.
Identifiers: *Submersible pumps.

The use of submersible pumps in the city of Belleville, Illinois to upgrade sewage handling is discussed. In addition to more efficient waste water handling, submersible pumps also offer the following advantages: only a single wet well is required; only one discharge valve is required for each pump, and no influent valve is required; accessory equipment such as fans, dehumidifiers, ladders, and lights is unnecessary; and maintenance and repair requirements are reduced. The submersible stations being installed in Belleville are all of the duplex type, each equipped with a pair of Flygt electric submersible pumps. Thus far, the installation of submersible pumps has saved about 3 hours each day in maintenance and inspection time. Another advantage of submersible stations is the relative ease of increasing station capacity as dictated by the growth of an area. At one pumping station, for example, the capacity was tripled by simply changing pumps and two components in the control panel; no changes in piping or other modifications were required. (Kreager-FIRL)
W76-12614

TYPES OF MICRO-ORGANISMS IN ACTIVATED SLUDGE IN DEPENDENCE OF TEMPERATURE AND NITRIFICATION (DIE BESIEDLUNG DES BELEBTEN SCHLAMMES IN ABHAENGIGKEIT VON TEMPERATUR UND NITRIFIKATION),
For primary bibliographic entry see Field 5A.
W76-12615

ELIMINATION OF TRACE-ELEMENTS BY SLOW-SAND-FILTRATION (ELIMINIERUNG VON SPURENMETALLEN DURCH LANGSAM-SANDFILTER),
U. Schoettler.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol. 9, No. 3, p 88-93, 1976. 17 fig, 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Trace elements, *Filtration, Sands, Zinc, Cadmium, Copper, Lead, Chromium, Metals.
Identifiers: *Sand filters, Slow sand filtration, Arsenic.

The behavior and cleansing capacities of a biologically based filtration system for zinc, cadmium, copper, lead, arsenic, and chromium were estimated by long-term tests with simulated slow-sand-filtration. EDTA's remobilizing ability was subsequently tested, underscoring complexing agents which are important in water treatment. Algae and the sand used for filtration were analyzed to determine changes during testing. The filters sufficiently eliminated all trace-elements except cadmium and arsenic. (Snyder-FIRL)
W76-12616

WASTE WATER TREATMENT -- A NEW CONCEPT (EPURATION D'EAUX RESIDUAIRES -- NOUVELLE CONCEPTION).
Informations Chimie, No. 152, p 165-166, February, 1976. 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Adsorption, *Percolation, *Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Activated carbon.
Identifiers: *Tecflow.

When activated carbon is located downstream from a biological waste water treatment installation, adsorption is frequently blocked by bacteria colonies. By placing the activated carbon upstream, the water's pH is kept fairly low, thereby minimizing bacterial growth. To optimize these conditions, a material was developed, Tecflow, which, in a first zone, acts as a fluidized bed adsorbent, and, in a second zone, as a fixed bed adsorber floating on the fluidized bed. This system allows for the percolation of waters containing up to 100 mg of suspended matter, thereby avoiding primary decantation which generally produces diluted and hard to dispose of sludge. A blockage of about 20% COD will lower toxicity concentrations by 50-70% after passage on Tecflow. Trials in a waste water plant producing 1,000 cu m/d of various solvent and industrial wastes effected a 99% BOD and 98% COD decrease. (Waltner-FIRL)
W76-12617

PERFORMANCE COMPARISON SURVEY OF THE PUBLIC SEWAGE-TREATMENT PLANTS IN BADEN-WUERTTEMBERG 1975 (LEISTUNGSVERGLEICH FUER KLAERANLAGEN 1975 IN BADEN-WUERTTEMBERG),
C-H. Burchard.
Forum Umwelt Hygiene, Vol. 27, No. 5, p 175-177, 1976. 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, Europe, Public utilities, Training, Water purification, *Performance.
Identifiers: *Baden-Wurttemberg(Germany).

Since 1972 Baden-Wurttemberg has had codes controlling public sewage treatment plants. Advanced training for operators of sewage works provides the necessary knowledge for bringing about this control. A 'Performance Comparison Survey' of the public sewage treatment plants in Baden-Wurttemberg was conducted for the second consecutive year in 1975. The purification procedure requirements were satisfied by 52% of the public sewage treatment plants operating in Baden-Wurttemberg. Outstanding purification performances were demonstrated by one out of seven plants. (Snyder-FIRL)
W76-12618

REMOVAL OF PHOSPHORUS AND NITROGEN FROM WASTEWATER BY SPRAY IRRIGATION OF LAND,
Michigan State Univ., East Lansing.
D. B. Shah.
Available from University Microfilms, Ltd., Ann Arbor, Mich., 48106, Order No. 76-12519. Ph.D. Thesis, 1975, 287 p.

Descriptors: *Waste water treatment, *Phosphorus, *Nitrogen, *Irrigation, *Waste water(Pollution), Adsorption, Nitrification, Denitrification, Mathematical models, Soil water movement, Soils.

Spray irrigation of land is being considered for the removal of phosphorus and nitrogen from waste water. Various reactions such as phosphorus adsorption, nitrification, and denitrification were studied, and mathematical models were developed to predict their movements in soil. The phosphorus model was derived using material balances on water and on phosphorus in the liquid and solid phase. It was assumed that non-equilibrium conditions prevail between phosphorus concentration in the liquid phase and on the soil. The water transport equation was dropped when it was determined that the water front moved much faster than the phosphorus front. Results of the simulation compared remarkably well with data from a spray irrigation site, and the soil system was efficient in phosphorus removal. Kinetic constants for the nitrification and denitrification reactions were evaluated. It was determined that nitrification can be considered a first order reaction in the range of nitrate concentrations encountered in waste water and that three times as much organic carbon is required as nitrate nitrogen for complete nitrogen removal. Material balance equations were written for ammonium nitrogen and nitrate nitrogen in the liquid phase and all the gas phase components. The simulation results compared very well with the experimental results; complete nitrogen removal was not accomplished even at very low flow rates. The nitrogen removal ability of the soil was found to be more important than its phosphorus removal capability in selecting a land disposal site. (Snyder-FIRL)
W76-12619

KINETICS AND PROCESS CONTROL OF NITRIFICATION IN COMPLETELY MIXED BIOLOGICAL WASTEWATER TREATMENT,
Texas A and M Univ., College Station.
A. C. Petrasek, Jr.
Available from University Microfilm, Inc., Ann Arbor, Mich., 48106, Order No. 76-12687. Ph.D. Thesis, 1975, 232 p.

Descriptors: *Waste water treatment, *Activated sludge, *Chemical oxygen demand, *Biological treatment, *Control, Nitrification, Oxidation, Hydrolysis, Testing, Ammonia, Organic compounds.
Identifiers: *Sludge age, *Kinetics, Ammonia nitrogen, Organic nitrogen.

A study was undertaken to determine the nitrification kinetics in completely mixed activated sludge processes and define the nitrification process control requirements for these systems. The kinetics of ammonia nitrogen oxidation and organic nitrogen hydrolysis were evaluated with 25 batch tests under varying conditions. Organic nitrogen hydrolysis to ammonia nitrogen follows first-order kinetics; ammonia nitrogen oxidation has zero-order kinetics. The reaction rate for organic nitrogen hydrolysis was significantly faster than that for ammonia nitrogen oxidation. More importantly, the rate depended on sludge age. To further determine the complex relationships existing in biological waste water treatment processes, five years of data from the Demonstration Plant of the Dallas Water Reclamation Research Center were evaluated. Sludge age was the best indicator for microorganism growth rate. Excellent correlations were developed between sludge and ratio of food to microbes, gross yield coefficient and sludge age, sludge age and dissolved oxygen uptake rate, and sludge age and Kjeldahl nitrogen removal. The significant improvement in chemical oxygen demand (COD) removal for activated sludge system operation in which nitrification takes place was also quantified. Alkalinity's importance was identified in process control for nitrifying activated sludge systems. A decrease in alkalinity of 6.0 mg/liter is indicated for each 1.0 mg/liter of total Kjeldahl nitrogen that is removed or oxidized. The data also indicate that sludge age should be increased by 0.56 days for every Fahrenheit degree decrease in the temperature of the aeration basin. (Snyder-FIRL)
W76-12620

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE WATER SUPPLY AND WASTEWATER SYSTEM, USING NONLINEAR PROGRAMMING,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5F.
W76-12621

WASTEWATER RECLAMATION AND RE-USE: THE RESPONSIBILITIES OF THE CONSULTING ENGINEER,
California Univ., Los Angeles.
C. H. Tate.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106, Order No. 75-26996. Ph. D. Thesis, 1975, 265 p.

Descriptors: *Waste water treatment, *Planning, *Design, *Water reuse, *Sanitary engineering, Public health, Costs, Treatment facilities.

The consulting engineer must provide sound input to all phases of waste water reclamation and reuse systems including initial planning, selection of a reclamation process and design of a reuse system. Prior to starting a waste water reclamation and reuse project, careful consideration should be given to preliminary factors including public health implications of reuse, applicable regulatory agency policies, and costs. The responsibilities of the consulting engineer in the various stages of waste water reclamation and reuse are illustrated by case studies. The planning process is described using the Comprehensive Water Quality Plan for the San Diego Basin. Testing, evaluation and selection of a recommended reclamation process are discussed with respect to the Prototype Plant Study for the Chino Basin Municipal Water District. The Expansion of the Wastewater Treatment Plant at Walt Disney World, Florida, is discussed as an example of reuse systems. (Orr-FIRL)
W76-12622

THERMOPHILIC AEROBIC MICROBIOLOGICAL TREATMENT OF HIGH STRENGTH WASTEWATERS AND RECOVERY OF PROTEIN,
Illinois Univ. at Urbana - Champaign.
G. A. Sueruecue.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 75-24413. Ph. D. Thesis, 1975, 164 p.

Descriptors: *Biological treatment, *Aerobic treatment, *Waste water treatment, Microorganisms, Bacteria, Chemical oxygen demand, Nutrient requirements, *Thermophilic bacteria.
Identifiers: Mesophilic bacteria, Solids retention time.

The thermophilic aerobic treatment of high strength waste waters was studied in both batch and continuous flow systems. The growth requirement of thermophilic organisms in mixed culture, the kinetic behavior of the culture, the effects of solids retention time on the system, and the protein content of the harvested biomass were considered. The rate of growth was highest at 58C. The minimal nutritional requirements for the organisms included methionine, magnesium, calcium, and iron as well as carbon, nitrogen, and phosphorus. The maximum removal of soluble organic matter was obtained when the system was operated with a solids retention time (SRT) of 5 days or more. A one day SRT achieved 85% COD removal, a 2 day SRT achieved 90% removal, and after 5 days the COD removal was 95%. The specific oxygen utilization rate depended upon the solid concentration and the specific substrate utilization rate which were themselves dependent upon the SRT. No nitrification occurred in any of the SRT systems studied. The thermophilic process is capable of treating high strength waste water more effectively and rapidly and of producing less sludge than a mesophilic system. The biomass produced contained about 45% protein. (Orr-FIRL)
W76-12623

ION EXCHANGE REMOVAL OF INORGANIC AND ORGANIC WASTEWATER CONSTITUENTS,
Colorado Univ., Boulder.
T. Panswad.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 75-23632. Ph. D. Thesis, 1975, 242 p.

Descriptors: *Waste water treatment, *Ion exchange, *Municipal wastes, *Water reuse, Activated carbon, Chemical oxygen demand, Resins, Anions, Operating costs, Organic compounds, Inorganic compounds.

A study was conducted jointly by the Denver Water Board and the University of Colorado on the use of ion exchange for demineralizing the Denver Metro waste water. Two anionic resins, Duolite S-37 and A-30B, were studied for their structure and capabilities in simultaneous removal of organic and inorganic materials. The resins were tested in conjunction with a weak acid-strong acid cationic exchanger couple. Using weak base resins prior to and after the cationic couple achieved about a 20% removal of COD. The system consisting of a cationic couple and a degasifier followed by an anionic resin bed was optimized. This system was capable of removing all sulfate ions, about 83% of the chloride ions, and 95% of the orthophosphate over a 200 bed volume throughput. When the system employed S-37 resin, average COD removal was 64.6%. COD removal averaged 50.1% when A-30B resin was used. Treatment costs were 29.4 and 27.2 cents/1000 gallons of water treated with S-37 and A-30B, respectively. The addition of activated carbon columns to the end of systems increased the overall average COD removal to 82.6 and 79.2% from the systems containing the S-37 and A-30B resins. The increase in treatment cost was 7.1 and 8.4 cents/1000 gallons, respectively. (Orr-FIRL)
W76-12624

NITRATE REDUCTION IN PEAT,
Minnesota Univ., Minneapolis.
B. A. Jaouich.
Ph. D. Thesis, 1975, 149 p.

Descriptors: *Waste water treatment, *Peat, Nitrogen compounds, *Denitrification, Biological treatment, Microorganisms, *Nitrates, Pseudomonas.

The reduction and removal of nitrogen compounds by biological denitrification in peat using three types of peat, Fibric, Hemic, and Sapric, were studied. Waste water from a local treatment plant was added to 60 cm deep columns of peat at different rates of application. Solutions of nitrate nitrogen from 10 mg/liter to 1000 mg/liter were added to the waste water to test the capacity and duration of the peat renovation system. With residence times between 1.75 and 7 days, Fibric peat was the most promising material for nitrogen removal, followed by Sapric and Hemic. The evolution of nitrous oxide and carbon dioxide was used as an index of biological denitrification. The concentrations of these gases increased as the amounts of nitrate nitrogen added increased. At the end of the experiment, the concentrations of total nitrogen had decreased in the upper layers of Fibric and Sapric, but were generally higher in Hemic. The concentrations of total carbon had decreased most in Hemic followed by Sapric and Fibric. Representative strains of denitrifying Pseudomonas spp., isolated from the peats, were most abundant in Fibric followed by Hemic and Sapric. It was shown that the isolated Pseudomondaceae reduced the added nitrates to elemental nitrogen. The peat waste water renovation system is an effective and inexpensive method for solving waste water problems where suitable land is available. Performance is excellent and operation is relatively simple. (Orr-FIRL)
W76-12625

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
R. Field, J. Curtis, and R. Bowden.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1191-1206, June, 1976. 156 ref.

Descriptors: *Urban runoff, *Urban drainage, *Overflow, *Sewers, *Combined sewers, Flow control, Indicators, Coliforms, Phosphates, Land use, Monitoring, Planning, Water quality control, Storm water, Storm runoff, Sampling, Legislation, Legal aspects, Model studies, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of documents dealing with urban runoff and combined sewer overflow is presented. General topics covered include: urban runoff quality, receiving water impacts, the monitoring of urban runoff pollutants, water quality control planning, runoff pollution modeling, flow regulation and control, and legislation for controlling urban drainage. Specific subjects discussed under the above general headings include: the effects of suburban development on runoff, a comparison of urban, watershed pollutant

levels with those in forested watersheds, the use of coliform and orthophosphate levels as indicators of stormwater impact, the suitability of automatic sampling and monitoring equipment for storm and combined sewer systems, required elements of a master plan for water quality control of combined sewer systems, data required for verifying stormwater models, design procedures for calculating settleable solids removal efficiency for combined sewer overflow regulators, and a model urban drainage ordinance. (Kreager-FIRL)
W76-12627

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
R. F. Unz.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1367-1378, June, 1976. 101 ref.

Descriptors: *Microbiology, *Waste water treatment, *Microorganisms, Nutrients, Bacteria, Viruses, Polymers, Metals, Ions, Toxicity, Activated sludge, Treatment facilities, Biodegradation, Byproducts, Suspended solids, Adsorption, Flocculation, Nitrilotriacetic acid, Phosphates, Analytical techniques, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of papers dealing with the microbiology of waste water treatment is presented. General topics covered include: sanitary microbiology and disinfection, waste water microbial dynamics, the toxicity of metal ions, the behavior of biopolymers, the existence of nuisance microorganisms, the nutrient composition of waste waters, biodegradation, anaerobic microbiology, and the occurrence of microbial byproducts as a result of waste water treatment. Specific topics discussed under the above general headings include: the development of selective agars for the recovery of fecal streptococci from waste water, changes in the composition and density of microbial populations in waste water transported through activated sludge treatment plants, methods for determining the biodegradable fraction of activated sludge, the degradation of metal chelated nitrilotriacetate complexes by Pseudomonas strains of bacteria, the failure of Leuconostoc mesenteroides to flocculate during the synthesis of an extracellular polymer, luxury phosphate uptake by activated sludge, the development of a shake flask procedure for the biodegradability screening of pollutants, and studies of single cell protein production in synthetic waste waters. (Kreager-FIRL)
W76-12628

WASTEWATER TREATMENT - PHYSICAL AND CHEMICAL METHODS, (LITERATURE REVIEW),
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
A. B. Scaramelli, and F. A. DiGiano.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1086-1096, June, 1976. 112 ref.

Descriptors: *Waste water treatment, *Membrane processes, *Coagulation, *Separation techniques, *Ion exchange, *Reverse osmosis, *Adsorption, Ozone, Activated carbon, Chemical precipitation, Phosphorus, Lime, Organic acids, Ammonia, Environmental effects, Treatment facilities, Chemical properties, Physical properties, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of physical and chemical methods of waste water treatment is presented. General topics covered include: process applications, coagulation and solids separation, adsorption, ion exchange, membrane processes, and ozonation. Examples of specific topics discussed under the above general headings include: quantitative evaluations of the total environmental impact of advanced waste water treatment, studies of the precipitation of phosphorus with lime, a comparison of the adsorptivity of activated carbons produced from lignite and bituminous coal, the use of ion exchange resins for the removal of humic acids, the use of reverse osmosis coupled with conventional waste water treatment, and the use of ozone for the removal of ammonia from waste water. (Kreager-FIRL)
W76-12629

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),
Delaware Univ., Dept. of Civil Engineering. Newark.
R. I. Dick.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1137-1166, June, 1976. 340 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Reclamation, Industrial wastes, Waste water treatment, Activated sludge, Spectrophotometry, Suspended solids, Analytical techniques, Byproducts, Oceans, Land use, Phosphorus, Heavy metals, Hazards, Polymers, Treatment facilities, Pulp and paper industry, Septic tanks, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of papers dealing with the treatment, utilization, and disposal of sludge is presented. Topics covered include: problems encountered by the Environmental Protection Agency in securing public support for land-based alternatives to ocean disposal, regional industrial sludge reclamation and disposal facilities, the treatability of sludges removed from septic tanks, options for sludge treatment and disposal in the pulp and paper industry, the effects of various phosphorus removal techniques on the quantity and quality of sludge produced at waste water treatment plants, processes for improving the dewatering of activated sludges, the heavy metal contents of different sludges, an automated spectrophotometric technique for measuring the suspended solids concentration of activated sludge, the influence of sludge characteristics and polymer properties on the selection of polymers for chemical sludges, direct slurry freezing of activated sludge using butane, the application of dissolved air flotation thickening to mixed primary and secondary sludges, the pyrolysis and combustion of sludge, industrial uses for sludge, problems associated with the ocean disposal of sludge, and potential hazards associated with the ocean disposal of sludge, and potential hazards associated with the application of sludge on agricultural land. (Kreager-FIRL)
W76-12630

WASTEWATER COLLECTION, (LITERATURE REVIEW),
Nottingham (H. D.) and Associates, Inc., McLean, Va.
T. Singh, and J. S. Bhutani.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p. 1170-1174, June, 1976. 42 ref.

Descriptors: *Sewers, *Conveyance structures, *Waste water treatment, Pipelines, Pumping plants, Infiltration, Inflow, Separated sewers, Materials, Monitoring, Inspection, Maintenance, Economics, Planning, Design criteria, Repairing, *Reviews, *Bibliographies.
Identifiers: *Collection systems(Sewers), *Literature reviews.

A literature review of papers dealing with waste water collection is presented. General topics covered include: planning, design, and construction considerations; inspection, monitoring, and maintenance activities; waste water pumping; and economic considerations. Specific subjects discussed under the above general headings include: the separation of combined collection systems into sanitary and storm sewers, the use of polyethylene pipe for collection systems, the advantages of pressure sewers over conventionally used gravity flow collection systems in areas with difficult terrain, a management program for the operation and maintenance of a waste water collection system, the restoration of deteriorated sewers, the limitations of current methods for identifying infiltration/inflow in sewer systems, improvements in the capability of existing lift stations, and the economic impact of infiltration and inflow problems associated with waste water collection systems. (Kreager-FIRL)
W76-12631

SECOND ATTEMPT TO TREAT ANGLIA'S TOXIC WASTES,
P. Millbank.
Surveyor, Vol. 147, No. 4380, p 17, May 21, 1976. 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Industrial wastes, *Liquid wastes, Reclamation, Foreign countries, Attitudes.
Identifiers: *Physical treatment, *Chemical treatment, *Toxic wastes, United Kingdom.

Hales Industrial Services have re-applied to build an industrial liquid waste reclamation and treatment plant near Bury St. Edmunds, Suffolk. A previous application 3 yr ago provoked much local controversy, and the county planning committee finally rejected it. The new application omits incineration, which had attracted the most local criticism. The new plant is considered to be very much in the country's interests. It also has implications for surrounding counties. The plant will reduce the long distance haulage of waste material. The objectives of the plant are to recover scarce materials, render wastes harmless, and offer reprocessing. Physical treatment will involve separation and filtration; chemical treatment will use reagents; and biological treatment will employ a high-rate filter. Up to 17,000 gallons of de-contaminated water and 30 tons of filter cake will be generated daily. The climate of informed opinion has shifted significantly in the direction of more regionalized treatment and disposal of notifiable wastes compared to when the original application was made. (Snyder-FIRL)
W76-12632

DESIGN OF INTEGRATED APPROACH TO NUTRIENT REMOVAL,
Brown and Caldwell, Walnut Creek, Calif.
D. L. Eisenhauer, R. B. Sieger, and D. S. Parker.
Journal of the Environmental Engineering Divisions, Proceedings of ASCE, Vol. 102, No. EE1, p 37-54, February, 1976. 6 fig, 11 ref, 1 append.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Water reuse, *Integrated control measures, Nutrients, Design, Reclamation, Reclaimed water, Industrial water, *Nutrient removal, *Design criteria, California.

The Central Contra Costa Sanitary District's Water Reclamation Plant currently being built near Concord, California, will produce water for industries located along the shores of Suisun Bay. Four miles of pressure pipeline will link the industries to the plant. Seventy-five percent of the reclamined water will be used for cooling and the remainder for process purposes. Reclaimed water in excess of industrial needs will be discharged to the bay. It will not harm the receiving waters because it will be virtually free of oxygen demanding materials, nutrients, and toxicants. The plant was designed following 2 yr of testing at the Advanced Treatment Test Facility (ATTF) at the site of the CCCSD's existing treatment plant. The new plant's treatment system combines lime clarification in the primary sedimentation tanks, biological nitrification-denitrification, a multimedia rapid sand filtration system for effluent polishing, a two-state sludge conditioning process, and a wet and dry lime classification process with recalcining

and lime recovery. The plant is designed for expansion and will be constructed in increments as the need arises. Nitrogen will be removed to prevent algal growth in receiving waters and industrial water systems. Phosphorus will be removed to control calcium-phosphate scaling. A dual computer system will monitor and control the entire plant process. (Snyder-FIRL)
W76-12635

INFLUENCE OF ACTIVATED SLUDGE CRT ON ADSORPTION.
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. R. Kim, V. L. Snoeyink, and F. M. Saunders.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 102, No. EE1, p 55-70, February, 1976. 12 fig, 2 tab, 21 ref, 1 append.

Descriptors: *Waste water treatment, *Activated sludge, *Chemical oxygen demand, *Treatment facilities, *Adsorption, Organic compounds, Effluents, Sewage treatment.
Identifiers: *Cell residence time.

The relationship between the operational characteristics of an activated sludge system and the concentration of nonadsorbable organic compounds present in the secondary effluent was studied. Activated sludge units were operated at cell residence times (CRT) of 0.8 days, 4.8 days, 12.3 days, and 19.4 days. Batch adsorption tests were conducted using secondary effluent from these systems. The equilibrium chemical oxygen demand (COD) for each was determined as a function of carbon dosage. Membrane separation techniques were used to fractionate the organic matter by size, in order to study the adsorption by activated carbon of the size fractions. Continuous flow column studies were also conducted. The CRT of an activated sludge system significantly affects the concentration of nonadsorbable organic matter in the effluent from the system. There was little change in the concentration of adsorbable material, however, particularly as the CRT was increased from 4.8 days to 19.3 days. The concentration of nonadsorbable material was not significantly affected by pH changes. Some nonadsorbable organic matter was present in each size fraction. Relatively simple laboratory batch tests can be used to determine the amount of nonadsorbable material in a waste water and thus to predict the best possible effluent achievable with a carbon column in the absence of biological activity. CRT should be considered as a new variable in addition to those currently used in designing treatment systems. The manner in which the secondary biological system is operated should be considered in any subsequent treatment of the effluent by activated carbon. (Snyder-FIRL)
W76-12636

PERFORMANCE OF SINGLE HOUSEHOLD TREATMENT UNITS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
R. J. Otis, and W. C. Boyle.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 102, No. EE1, p 175-189, February, 1976. 6 fig, 5 tab, 8 ref, append.

Descriptors: *Waste water treatment, *Pollutant identification, *Biochemical oxygen demand, *Chemical oxygen demand, *Treatment facilities, *Domestic wastes, *Performance, Anaerobic conditions, Aerobic treatment, On-site tests, Septic tanks.

Eight installations at private homes in Wisconsin were used to test anaerobic and aerobic household waste treatment processes. These included six systems with single compartmented septic tanks, one with two septic tanks in series, two with continuous flow-through extended aeration units, and one with a batch aeration unit. Samples from each step in the treatment process were analyzed for biochemical oxygen demand (BOD), chemical oxygen demand (COD), solids, total nitrogen, phosphorus, total and fecal coliform, and fecal streptococcus. Effluents from aerobic units had mean concentrations of mg/liter BOD and 53 mg/liter total suspended solids (TSS) as compared to 158 mg/liter BOD and 54 mg/liter TSS in septic tank effluent. Most of the aerobic processes, however, would not meet current national secondary effluent BOD and TSS criteria without modification or additional processing. Septic tanks were more stable in seven of the 11 parameters tested. Nearly complete nitrification and some denitrification occurred in the aerobic units; ammonia and organic nitrogen dominated in septic tank effluent. The following appear beneficial in maintaining high effluent quality from aerobic units: a septic tank or trash trap preceding the aeration chamber to remove grease, floating solids, and large debris; flow equalization; returning floating solids at least twice daily; maintaining mixed liquor temperatures above 15C; effluent weirs at least 24 in. long with scum and deflection baffles; and regular maintenance with inspections at least ever 2 mo. (Snyder-FIRL)
W76-12637

ALBUQUERQUE PLANT DESIGNED WITH COMPUTER IN MIND,
William Matotan and Associates, Albuerque, New Mex.
J. L. Ricoy, and W. I. Matotan.
Water and Wastes Engineering, Vol. 13, No. 1, p 32-35, 37, January, 1976.

Descriptors: *Treatment facilities, *Waste water treatment, New Mexico, Activated sludge, Trickling filters, *Aeration, Computers, Equipment, Settlement basins, Anaerobic digestion, *Sewage treatment, Waste disposal.
Identifiers: Process control, Albuquerque(NM), Screw pumps.

A new secondary treatment plant in Albuquerque is described. The new activated sludge waste water treatment plant includes a process control computer system, new laboratory testing equipment, and monitor sensors. The two existing plants incorporates trickling fpuilters. In the new scheme, effluents from the two old plants combine and pass through a series of screw pumps to the aeration tanks, the final settling tanks, and then to the Rio Grande river for disposal. Aeration facilities were designed so that the plant can operate as either conventional taped aeration, step aeration, or contact stabilization. Diffused air is used for mixing and oxygen needs. Final settling tanks are of rapid sludge removal type. Anaerobic digestion handles sludge solids, and the resulting gas is used to generate electricity through the system. Pumps and blowers are controlled by the computer on the basis of a running time inventory. This is also used an aid in determining maintenance and overhaul schedules. Dissolved oxygen levels in the aeration tanks are continuously monitored by the computer. Algorithms are provided in the system for a wide variety of controls and samplings. The computer has a fixed head mass memory of 246K and a core memory of 24K, both expandable. (Pinto-FIRL)
W76-12638

WASTEWATER TREATMENT FACILITY, PARIS UTILITY DISTRICT,
Consulting Engineer, Vol. 46, No. 6, p 67, June, 1976. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Utilities, *Food processing industry, *Cities, Domestic wastes, Tannery wastes, Industrial wastes.

Two industries and a town worked together for over a decade developing a sophisticated waste water treatment facility. The industrial-municipal plant, designed for combined domestic, tannery, and food processing wastes, eliminated the necessity for separate facilities. The two industries which had previously discharged inadequately treated waste to the Little Anroscoggin River, now satisfy state and Federal waste discharge requirements. The city now has the services necessary for future industrial and residential development without river pollution. The facility treats about 1.35 mgd combined industrial and domestic wastes. The process controls and blends the waste streams for optimal performance, and incorporates several unusual operations. Automatic pumping systems for pH control optimize clarification removal and prevent release of odorous gases by sulfides in the waste. Chromium is removed by chemical precipitation brought about by equalizing two waste streams with pH control without added chemicals. Tannery stack gas serves as a carbon dioxide source reacting with free lime in industrial waste, forming calcium carbonate. Refractory chemical removal is optimized by unconventional upflow clarifiers. Maintenance and operation costs are reduced by separate sludge centrifugation. Other features that reduce costs and improve efficiency include a multiuse pumping system, automatic recording process controls and alarm systems, and a space and cost saving 800-kw turbine engine. (Snyder-FIRL)
W76-12639

SEPTIC TANK EFFICIENCY,
ADI Ltd., Fredericton (New Brunswick).
T. Viraraghavan.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 102, No. EE2, p 505-508, April, 1976. 3 tab, 2 ref, 1 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Sewerage, *Treatment facilities, Biochemical oxygen demand, Chemical oxygen demand, *Septic tanks, Efficiencies.

A study on the actual performance of a rural household septic tank was carried out for the year 1973. Samples of raw sewage and septic tank effluent were analyzed for pH, total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), soluble organic carbon (SOC), total phosphates (P04-P), ammonia nitrogen, nitrate nitrogen, total soluble iron, chlorides, total coliforms, fecal coliforms, fecal streptococci, Standard Plate Count (SPC), and Pseudomonas aeruginosa. About 20% of the TSS and 50% of COD and BOD were removed by the septic tank. There was very little indicator organism removal. However, over 80% of Pseudomonas aeruginosa was removed by the septic tank. Lower removals of TSS and bacteria may result from reentrainment of sedimented material into the effluent stream. (Snyder-FIRL)
W76-12640

ALUM SLUDGE DRYING WITH BASIC EXTRACTIVE TREATMENT,
Resources Conservation Co., Renton, Wash.
For primary bibliographic entry see Field 5E.
W76-12641

A NEW APPROACH TO THE DESIGN OF FILTRATION SYSTEMS,
Loughborough Univ. of Technology (England). Dept. of Chemical Engineering.
D. C. Freshwater.
Filtration and Separation, Vol. 13, No. 3, p 244-248, May-June, 1976. 9 fig, 2 tab, 8 ref, 1 append.

Descriptors: *Waste water treatment, *Analytical techniques, *Treatment facilities, *Design, *Filtration, Suspended solids, Liquids, Optimization.

It is important, in designing solid-liquid separation processes, to consider the system as a whole and not simply the individual design and specification

of the separate plant items. First the problem must be defined, including the nature of the feed, the changes that may occur during filtration, and the desired product quality. Then several alternative processing systems are chosen for consideration in detail. The alternatives are then assessed, beginning with calculating the material balance over the system. After the most appropriate system is chosen, it is optimized to produce the given throughput at a minimum cost. Allowance must be made for uncertainty, including variations in feed, environmental conditions, and throughput. Reliability theory may be used to assess the success probability of a given design. (Snyder-FIRL)
W76-12642

TURN SEWAGE INTO FUEL.
Canadian Chemical Processing, Vol. 60, No. 6, p 4, 6, June, 1976. 2 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Biochemical oxygen demand, *Treatment facilities, *Fuels, Coals, Filters, Ions, Cadmium, Iron, Chromium, Manganese, Zinc, Copper.

A sewage treatment process under development produces a combined coal and sludge by-product that could be used as fuel. A filter bed of finely crushed coal is used to give a final biological oxygen demand of under 2 ppm and a 90% reduction in heavy metal ions. Effluent is charged from the upper part of the settling tank; suspended solids and additional pollutants settle to the bottom where they combine with coal particles for removal from the system. The supernatant liquid flows into a sump tank surrounding the settling tank. The filter bed absorbs cadmium, iron, chromium, manganese, zinc, and copper ions, along with wastes that induce biochemical oxygen demand (BOD) at between 0.5 and 0.6 gm/gm of coal. The treated water flows from the outer edge of the filter bed into another cylindrical tank where it is charged onto a sprinkling filter bed of coal to be treated further. A rake arm on the inclined lower part of the structure rakes out loaded coal particles in small portions from the lowest part of the filter bed. This sludge is then raked to the tank's center-well, where a bucket conveyor raises it to the upper part of the structure for disposal along with suspended solids and other wastes from the settling tank. One kg of coal sludge is generated for each cu m of waste water treated. It contains up to 60% water and can provide a minimum of 2,000 cal/gm when burned. The sludge could supply up to 15% of the required fuel for a power plant. Its heavy metal content would present no problem; it would be collected in the ash residue. (Snyder-FIRL)
W76-12643

EFFLUENT IRRIGATION OF RYE AND RYEGRASS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and H-C. Ku.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE2, p 475-483, April, 1976. 4 fig, 6 tab, 12 ref, 2 append.

Descriptors: *Effluents, *Irrigation, *Soil types, *Florida, *Forages, Weight, Harvesting, Rates of application, Soil moisture, Nutrients, Potassium, Absorption, Crop production, *Grasses, Water reuse, Recycling.
Identifiers: *Rye, *Ryegrass.

Rye and ryegrass grown on sandy soil in Florida were irrigated with secondary effluent. Forage was weighed after harvesting and samples were analyzed. Both responded well to irrigation with secondary municipal effluent. Dry matter yields showed a positive response to increased irrigation rates. Dry matter content decreased with irrigation, since soil moisture was more available to plants. Nutrient uptake generally increased and recovery efficiency declined with application rate. The effluent was deficient in potassium relative to other elements for production of rye or ryegrass. Potassium uptake exceeded applied potassium for most irrigation rates for both crops. Supplemental potassium might improve crop production with effluent irrigation. (Snyder-FIRL)
W76-12644

THE USE OF FLUID CATALYTIC CRACKING CATALYST IN ACTIVATED SLUDGE WASTE-WATER TREATMENT,
Exxon Research and Engineering Co., Linden, N.J. Corporate Research Labs.
R. D. Schwartz, and C. J. McCoy.
Journal Water Pollution Control Federation, Vol. 48, No. 2, p 274-280, February, 1976. 2 fig, 5 tab, 5 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Activated sludge, *Sewerage, *Catalysts, Activated carbon, Waste water(Pollution), Industrial wastes, Municipal wastes.
Identifiers: Refinery wastes.

Regenerated spent fluid catalytic cracking catalyst was assessed as an enhancer of conventional activated sludge water treatment systems and compared with activated carbon. Activated sludge and waste water were obtained from a refinery and a municipal sewage treatment plant. The sludge was allowed to settle for one hour, after which the supernatant was removed and replaced with waste water. The sludge-waste water mixture and either cracking catalyst or activated carbon were incubated at 30 C and shaken, after which the sludge settling rate and percentage settling by volume, and the percentage transmittance at 660 nm and total organic carbon (TOC) of the supernatant were measured. The catalyst increased the sludge settling rate, decreased the settled sludge volume and supernatant TOC, and increased supernatant clarity of a refinery activated sludge system as compared with conventional activated sludge treatment alone. It markedly reduced phosphate levels in a municipal sewerage activated sludge system. The catalyst may be acting like other aluminas and alumina-silicates, which absorb microorganisms and organic compounds. Results with refinery activated sludge were more promising than those with municipal sewerage activated sludge. Because of a dilute sludge and low initial TOC levels in the waste water, however, the municipal sewerage activated sludge may not have been a suitable test system. The observed effects may result from the support adsorbing contaminants directly, providing a surface on which the microbial population can adsorb, and promoting sludge settling and compaction by acting as a nucleation center for the bio-floc,
W76-12646

NITRIFYING ORGANISM CONCENTRATION AND ACTIVITY,
Union Carbide Corp., Tonawanda, N.Y.
E. G. Srinath, R. C. Loehr, and T. B. S. Prakasam.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE2, p 449-463, April, 1976. 8 fig, 4 tab, 9 ref, 2 append.

Descriptors: *Waste water treatment, *Analytical techniques, *Microorganisms, *Nitrification, *Waste water(Pollution), Oxidation, Rates, Nitrites, Cultures.
Identifiers: *Mixed liquor.

A technique was developed to estimate the concentration of active nitrifying organisms in waste water mixed liquor. The oxidation rates for ammonium and nitrite in the mixed liquors were compared with those obtained with pure cultures of Nitrosomonas europaea and Nitrobacter agilis and N. winogradskyi suspended at known concentrations in a mineral salt medium containing their respective substrates. pH 7.4 to 7.9 was used as a reference to determine the rates, since this was the range where maximum rates occurred. The ratio of the specific oxidation rates of the nitrifying population of the mixed liquor and pure cultures under similar pH and temperature conditions represents the portion of the mixed liquor total Kjeldahl nitrogen (TKN) contributed by cellular TKN of autotrophic nitrifiers. This ratio yields the nitrifying organisms' TKN concentration when it is multiplied by the mixed liquor TKN concentration. The technique seems promising in aiding improved operation and design of nitrification processes and understanding the factors that affect these processes. The substrate concentrations did not affect the oxidation rates. The oxidation rates of nitrate and ammonium, at concentrations above 10 mg nitrogen/liter had zero-order kinetics. The pH influenced the oxidation rate. The pH optima were in the range of 7.4 to 7.9, and the concentration of nitrifying organisms in the system influenced the rate of oxidation. (Snyder-FIRL)
W76-12647

PRACTICAL ASPECTS OF ANAEROBIC DIGESTION,
Rowett Research Inst., Bucksburn (Scotland).
R. Summers, and S. Bousfield.
Process Biochemistry, Vol. 11, No. 5, p 3-6, June, 1976. 1 fig, 2 tab, 18 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Anaerobic digestion, Waste disposal, Energy, Organic wastes.
Identifiers: Energy production, Pollutional load.

The use of anaerobic digestion for waste disposal and energy production is discussed. Historically, the process has been used to reduce the pollutional load of strong, organic wastes of various kinds; recently the energy produced has become increasingly important. Anaerobic digesters are often used to treat domestic sewage. The gas produced may be used for heating needs at the digester site or for generating electricity. Some industrial wastes are suitable for anaerobic digestion, including slaughterhouse, fruit and vegetable, alcohol fermentation, and pulp and paper wastes. Because of their strength, an aerobic digester is often used to treat such wastes on-site before discharging them into a public sewer. Farm wastes are very amenable to anaerobic digestion. Two types of anaerobic digesters are used for farm wastes: the small, warm-climate Gobar gas unit and larger, heated digesters used in temperate climates. Pilot plant tests for the larger systems showed that digestion must be built up gradually. Operational problems include greater scum formation than in domestic digesters and the need for more stirring. Even during cold weather, an aerobic digester using farm waste can produce more energy in the form of gas than is needed to run them. (Snyder-FIRL)
W76-12648

A SURVEY OF PHOSPHORUS REMOVAL IN WISCONSIN,
Howard, Needles, Tammen and Bergendoff, Milwaukee, Wis.
D. A. Braasch, and E. F. Joeres.
Water Sewage and Works, Vol. 123, No. 7, p 70-73, July, 1976. 8 tab, 15 ref.

Descriptors: *Waste water treatment, *Phosphorus, *Surveys, *Wisconsin, *Regulation, Costs, Evaluation, Performance, Treatment, Legal aspects, Chemical wastes, Water pollution control, Pollution abatement.

Phosphorus removal data are presented for 50 plants in the state of Wisconsin affected by the state's phosphorus removal policy. As of August 1974, 17 plants were achieving phosphorus removals from the influent exceeding 85%. Out of 50 plants providing treatment for phosphorus

removal, less than half of the plants were attaining the required phosphorus reductions. Data are also presented on the types of phosphorus removal treatment being used by each plant; however the relative merits of alternative chemicals or treatment methods are impossible to evaluate because of local treatment problems and conditions. The major cost associated with phosphorus removal methods used in Wisconsin is the chemical cost. Treatment problems resulting in high chemical doses and the temporary nature of some chemical storage and feed facilities make the treatment costs difficult to interpret and evaluate. (Kreager-FIRL)
W76-12649

WASTE-TREATMENT SYSTEM CUTS ENERGY REQUIREMENTS.
Chemical Engineering, Vol. 83, No. 16, p 57-58, August 2, 1976.

Descriptors: *Biological treatment, *Oxidation, *Energy, *Biological membranes, *Waste water treatment, Suspended solids, Biochemical oxygen demand, Materials, Efficiencies, Costs, Filtration, Sewage treatment.
Identifiers: GaryGlas treatment system.

GaryGlas, a highly porous and rigid silica biological oxidation medium, is described as an economical alternative to more complex and more energy intensive aerated sludge treatment processes. Field tests on GaryGlas treatment systems varying in size from 40,000 to 2,100,000 gallons/day indicate that the medium does not require backwashing or forced aeration for the sustenance of the biological oxidation process. The material's intended use is as a secondary filter medium, although GaryGlas can also be used in tertiary polishing filters. Though priced about three times higher than competitive secondary treatment media, GaryGlas displays removal efficiencies that are 33-80% higher for both biochemical oxygen demand and total suspended solids. GaryGlas can be contained in vessels of concrete, fiberglass, or corrosion-proofed steel; the receptacle need offer only side support and wind resistance. (Kreager-FIRL)
W76-12650

U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND ENVIRONMENTAL POLLUTION ABATEMENT PROGRAM,
R. P. Schmitt, and R. P. Carnahan.
Industrial Water Engineering, Vol. 13, No. 1, p 25-26, February/March, 1976.

Descriptors: *Waste water treatment, *Reclamation, Pollutant identification, *Model studies, *Programs, Federal government, Desalination, Sea water, Brackish water, Ozone, Ultraviolet radiation, Organic compounds, Industrial wastes, Land use, Economics, Analytical techniques, Polymers, Reverse osmosis.

The United States Army Mobility Equipment Research and Development Command's program in water and waste management is reviewed. The program includes the research and development of water supply systems for the production of potable water, systems for the storage and distribution of water, well drilling equipment, equipment for the collection and treatment of waste water designed for reuse and/or disposal, portable incinerators, and watercraft for waste treatment. Specific projects underway include: the development of reverse osmosis units for the desalination of brackish and sea water, studies of the destruction of bio-refractory organic compounds in water using ozonolysis catalyzed with ultraviolet light, the development of a carbon/polymer treatment process for reclaiming laundry waste water, the identification of trace organics in water, and the development of a land use modeling program aimed at determining the most economical and environmentally compatible use of land at military facilities. (Kreager-FIRL)
W76-12651

WASTEWATER RESOURCES IN NORTH CENTRAL TEXAS,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5G.
W76-12652

WATER-POLLUTION INSTRUMENTATION,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5A.
W76-12653

CONCENTRATIONS OF NITRIFYING BACTERIA IN SEWAGES, EFFLUENTS, AND A RECEIVING STREAM AND RESISTANCE OF THESE ORGANISMS TO CHLORINATION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
P. F. Strom, V. A. Matulewich, and M. S. Finstein.
Applied and Environmental Microbiology, Vol. 31, No. 5, p 731-737, May, 1976. 2 fig, 2 tab, 27 ref.

Descriptors: *Microbiology, *Bacteria, *Waste water(Pollution), *Waste water treatment, *Chlorination, Resistance, Effluents, Microorganisms, On-site investigations, Pollutant identification, Activated sludge, Sewage, Domestic wastes, *Nitrogen fixing bacteria.
Identifiers: *Nitrifying bacteria, Most probable number technique.

Estimates of nitrifying bacteria (NH4(+) and NO2(-) oxidizers) in samples from four activated sludge plants treating mainly domestic sewage were obtained using a most probable number technique. Concentration ranges per milliliter were 1010-3880 and 79-145 in settled sewages, 32-7420 and 2-1010 in secondary effluents, and from less than 0.1 to 622 and 0.1-70 in chlorinated secondary effluents. These results indicated that nitrifiers are more resistant to chlorination than fecal streptococci. Laboratory studies with these nitrifying bacteria involving chlorine exposures of up to 2 milligrams/liter for 0-60 minutes also indicated that nitrifiers are more resistant than fecal streptococci to chlorination, with the NO2(-) oxidizers showing the greatest resistance. Below the outfall of a sewage plant that discharges heavily chlorinated unnitrified effluent, NH4(+) oxidizers amounted to approximately 20 million/gram of slime scraped from stream-bed rocks. The figure upstream of the outfall was about 300,000/gram. (Kreager-FIRL)
W76-12654

PHYSICOCHEMICAL WASTEWATER TREATMENT METHODS, (IN GREEK),
M. A. Delichatsios.
Texnika Xponika, Vol. 44, No. 5, p 227-230, 1975. 3 fig, 9 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, *Coagulation, *Adsorption, *Sedimentation, Suspended solids, Organic matter.
Identifiers: *Physico-chemical treatment.

Physico-chemical methods of waste water treatment use coagulation and sedimentation to remove suspended solids, and carbon adsorption columns to remove organic matter. Compared with biological treatment methods, these methods operate reliably for varying qualities of waste water and have improved economy and efficiency. The basic laws in such a system with respect to the phenomena of coagulation, breakup and sedimentation of the suspended solids in turbulent flows have been developed. Knowledge of these laws leads to intelligent design of systems for waste water treatment. A new system using coagulation in turbulent pipe flows was proposed with the advantage of substantially reduced space requirements compared with traditional systems. (Snyder-FIRL)
W76-12655

A CONTRIBUTION TO STABILIZATION PONDS DESIGN, (IN GREEK),
P. S. Kollias.
Texnika Xponika, Vol 44, No 5, p 219-225, 1975. 3 fig, 5 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Sewerage, *Oxidation lagoons, *Treatment facilities, Biochemical oxygen demand, *Design criteria.

Stabilization ponds are shallow basins treating organic wastes, especially sewage, by storing it under conditions favoring natural biological treatment. Stabilization ponds may be used alone or following preliminary treatment. The processes occurring simultaneously include sedimentation and biofloculation, aerobic bacterial oxidation, and photosynthesis. Applications of these ponds and their classification, performance, and design criteria are discussed. An empirical equation with a rational basis for the volume of stabilization is given. Experimental ponds and biochemical oxygen demand (BOD) efficiency are discussed and the method of design is described analytically. A sample system serving a population of 4500 inhabitants near Mer a Aude is described. (Snyder-FIRL)
W76-12656

ANTHRACITE ACTIVATED CARBONS: MANUFACTURE AND APPLICATIONS,
J. S. Batchelor.
Filtration and Separation, Vol 13, No 3, p 316, May-June, 1976. 7 ref.

Descriptors: *Waste water treatment, *Coals, *Activated carbon, *Industrial production, *Adsorption, Quality control, Potable water, Effluents, Detergents, Pesticide removal, Liquids, Gases.
Identifiers: Dechlorination.

Anthrasorb activated carbons are manufactured from anthracite. The manufacturing process, characterization, quality control, and technical services are described. The largest markets in liquid phase adsorption are the sugar industry and water and effluent treatment. Activated carbons are important in treating both potable water and effluents. One grade of Anthrasorb is extensively used to dechlorinate water on ships and oil rigs. Granular Anthrasorb is widely used for effluent treatment applications as diverse as removal of detergents from vehicle washing plant waters and removal of biocides from effluents at a pesticide plant. Other liquid and vapor phase applications are also discussed. (Snyder-FIRL)
W76-12658

A FRESH APPROACH TO MICROSTRAINING,
D. L. B. Arnold.
Filtration and Separation, Vol 13, No 3, p 272-278, May-June, 1976. 8 fig, 1 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Filters, *Filtration, Fabrics, Suspended solids, Efficiencies, Pores, Size.
Identifiers: *Microstraining.

In microstraining, water is strained under a low differential head through a fine woven fabric in a rotating drum. The suspended matter retained by the mesh contributes to straining efficiency by effectively reducing the size of the pores in the fabric. Microstrainer design is discussed, including construction, fabric panels, backwashing, driving system, hydraulics, structure and housing. Filter fabrics are usually made of stainless steel or,

where the possibility of corrosion exists, plastic. The aperture,size is usually between 20 and 40 microns. The removal efficiency is determined by the mechanics of mat formation. Microstraining is used for water supply after treatment as well as for tertiary treatment of biologically purified sewage, generally after sedimentation. The Filtester, a small, inexpensive device, can be used to determine the capacity of a microstrainer. It filters a sample of the water to be treated through a piece of clean microfabric, determining the volume of water filtered in a time interval corresponding to the submersion time of an element of microfabric in normal microstrainer operation. (Snyder-FIRL)
W76-12659

RECOVERY OF P2O5 FROM WASTE-WATERS BY ADDING LIME (SEKKAI SHORI NI YORU HAISUICHU NO P2O5 NO KAISHU),
M. Mori.
Kekko to Sekkai, (Gypsum and Lime), No 142, p 111-113, May, 1976. 3 fig, 2 tab, 4 ref.

Descriptors: *Waste water treatment, *Phosphorus compounds, *Waste water(Pollution), *Lime, *Chemical wastes, Laboratory tests, Chemical analysis, *Chemical precipitation, Fluorine, Crystals, Solubility.
Identifiers: *Phosphorus pentoxide recovery.

Adding lime to recover phosphorus pentoxide in waste water from wet process phosphoric acid plants was studied by means of laboratory tests. The products were also analyzed. Prior to phosphorus pentoxide precipitation, most of the fluorine was precipitated as calcium fluoride at pH 3 to pH 4; the remainder of the phosphoric acid was then precipitated as fine apatite crystals. The size of the apatite crystals varied with the amount of fluorine in the waste water. Although citrate solubility varied with the crystal size, all of the apatite was entirely soluble in a 2% solution of citric acid. (Snyder-FIRL)
W76-12660

FLOTATION: TWO FRESH WAYS TO TREAT EFFLUENTS,
Imperial Chemical Industries, Ltd., London (England).
D. B. Chambers, and W. R. T. Cottrell.
Chemical Engineering, Vol 83, No 16, p 95-98, August 2, 1976. 2 fig, 5 tab.

Descriptors: *Waste water treatment, *Flotation, *Bubbles, *Electrolysis, Industrial wastes, Suspended solids, Lipids, Biochemical oxygen demand, Oil wastes, Efficiencies, Sludge treatment, Flocculation.
Identifiers: *Microflotation, *Electroflotation.

The treatment of waste water with electroflotation and microflotation techniques is discussed. Electroflotation, which involves the generation of bubbles by electrolysis, is especially recommended for low flow rates (less than 25 cu m/hr). Data compiled from 20 electroflotation units that treat industrial effluents in the United Kingdom indicate that electroflotation is a practical, first-stage treatment for reducing suspended solids, fats, and biochemical oxygen demand as well as for sludge thickening. Microflotation, which is a dissolved-air flotation technique, combines the benefits of advanced chemical flocculation with a novel and simple method for generating air bubbles which leads to the removal of solids, fats, and oils by flotation. In addition to its simplicity and ease of operation, microflotation requires little space. Large interfering air bubbles are absent, and solids removal is usually in excess of 99%. About 19 full-scale plants are operating in Sweden, and others are under construction in Finland, Norway, the United Kingdom, and Japan. (Kreager-FIRL)
W76-12661

RECENT DEVELOPMENTS IN SEWAGE TREATMENT AND EQUIPMENT,
G. E. Thompson, and G. J. Maguet.
Water and Pollution Control, Vol 114, No 7, p 28, 30-33, July, 1976. 5 fig, 9 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, Physical control, *Activated sludge, *Disinfection, Trickling filters, Lime, Iron compounds, Chlorides, Nitrification, Denitrification, Ozone, Radiation, Efficiencies, Equipment, Performance, Gamma rays, *Canada.
Identifiers: Rotating discs, Alum, Ferric chloride, Physico-chemical treatment, Bromination.

Improvements in sewage treatment methods and equipment are reviewed. Improved tank designs for primary clarification have resulted in increased organics removal and virtual elimination of short circuiting. The use of pure oxygen instead of air in biological treatment schemes is a process improvement which is typified by low retention times, excellent removal efficiencies, and excellent sludge characteristics. The use of deep tanks (up to 22 ft) in activated sludge processes has resulted in transfer efficiencies up to 100% greater than those previously achieved with virtually identical aeration equipment. The rotating biological contactor, which is a modification of the trickling filter process, is typified by extremely low power requirements and excellent reaction to shocking. Physico-chemical treatment processes involving waste water treatment with chemicals such as lime, alum, and ferric chloride are compact and provide high-grade treatment. The introduction of the nitrification-denitrification step into the treatment of waste water for nutrient removal represents a new process addition to the sewage treatment plant. Other new treatment processes in the field of disinfection include: ozonation, bromination, and gamma radiation. (Kreager-FIRL)
W76-12662

DIGESTION OF AQUEOUS WASTES WITH OXYGEN PRESSURE-RECYCLING OXIDATION SEWAGE TREATMENT,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
D. F. Othmer.
Process Biochemistry, Vol 11, No 5, p 8-10, 17, June, 1976. 1 fig, 5 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Digestion, Waste water(Pollution), Liquid wastes, Oxygen, High pressure, Recycling, Oxidation.

Oxidation of wastes is due to strictly chemical action, enzymatic action, and biochemical action. Both biochemical and enzymatic influences on oxidation are lost at temperatures much above the ambient, but the chemical action is substantially increased at high temperatures and pressures. A number of considerations favor the use of oxygen or oxygen-enriched air in the aerobic digestion of sewage waters. In the best known system using oxygen at atmospheric pressures, several covered conventional aerated digestor tanks are connected for liquid flow and for gas flow in the space above the liquid. Several sewage treatment systems have been used which use increased pressure to dissolve oxygen from air more rapidly. In an improved method using higher pressures, the pressurized waste waters are depressurized after using the oxygen dissolved in them, releasing other dissolved gases. More oxygen is then dissolved by pressurizing the waste waters again with air or oxygen. In one system that can be used for this pressure-recycling oxidation sewage treatment, the aerated influent sewage enters the inner cylinder which also acts as a digester for the organics. The liquid overflows the top of the inner cylinder, and, in the space outside the cone, flocculation and settling of solids and clarification of the liquid take place. This system may act as a complete sewage treatment plant, especially in small sizes. It may also be incorporated with other conventional equipment and processing in larger industrial or municipal plants. (Snyder-FIRL)
W76-12663

BULKING CONTROL MADE EASY - WITH HYDROGEN PEROXIDE,
FMC Corp., Princeton, N.J.
W. G. Strunk, and J. Shapiro.
Water and Pollution Control, Vol 114, No 7, p 10, 12, 14, 15, 40-41, July, 1976.

Descriptors: Analytical techniques, *Activated sludge, *Microenvironment, *Microscopy, *Microbiology, Bacteria, Protozoa, Microorganisms, *Waste treatment, Oxidation.
Identifiers: *Hydrogen peroxide, *Sludge bulking control.

A visual means for predicting potential bulking situations with activated sludge systems and for pinpointing the time at which hydrogen peroxide treatment should begin is described. Sludge bulking involves failure of the sludge to settle adequately, with suspended solids passing out with the effluent. This is most frequently caused by the growth of filamentous bacteria which are susceptible to oxidative attack by hydrogen peroxide. When bulking is imminent, changes occur in the animal and bacterial life in the sludge that can be observed by microscope. Filamentous bacteria can be seen at 100 power magnification when bulking is imminent but are rare in a sludge which compacts and settles readily. Protozoa are also easily observed at 100 power magnification and are the best index of the health of activated sludge. Microscopic observations of four distinct stages of microbiological activity as sludge goes from a healthy state, through incipient bulking, to full bulking, and back to the healthy state are described. Corrective action with hydrogen peroxide is recommended as soon as the initial growth of filamentous bacteria is observed. (Kreager-FIRL)
W76-12664

THE OPERATION OF A SIMPLEX ACTIVATED SLUDGE PILOT PLANT IN AN ATMOSPHERE OF PURE OXYGEN, PART 2,
L. B. Wood, R. P. King, M. K. Durkin, H. J. Finch, and D. Sheldon.
The Public Health Engineer, Vol 4, No 3, p 67-75, May, 1976. 13 fig, 3 tab, 20 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Pilot plants, *Oxygen, *Atmosphere, Air, Oxidation, Ammonia, *Treatment facilities.

Discussion is continued of a study of the use of oxygen to replace air in the activated sludge process, particularly with respect to more rapid oxidation of the carbonaceous substrate, more rapid oxidation of ammonia, and the production of smaller quantities of activated sludge with better settling characteristics and higher solids content. There was no evidence of a higher rate of carbonaceous substrate removal on a kinetic basis. Nevertheless, high dissolved oxygen concentrations are attainable, and higher mixed liquor solids can be maintained at higher plant loadings. The maximum growth rate of Nitrosomonas can be reduced in single-stage systems by low pH in mixed liquor where the latter is enclosed with oxygen, and carbon dioxide is allowed to build up in the gas space. No acclimatization to low pH is apparent. There is no reduction in the quantity of sludge produced. The growth rate associated with organisms oxidizing carbonaceous substrate is similar to that with air-based sludge yield. There was no evidence of increased sludge removal by endogenation and lysis. No special advantage was revealed by the settlement of the sludge as measured by the standard procedure and used for calculation of linear settlement rate. High sludge density indices apparently did not develop. (See also W76-09669) (Snyder-FIRL)
W76-12665

ESTIMATING THE RELIABILITY OF ADVANCED WASTE TREATMENT - PART 2,
Southwest Ohio Regional Computer Center, Cincinnati.
R. B. Dean, and S. L. Forsythe.
Water Sewage and Works, Vol. 123, No. 7, p 57-60, July, 1976. 7 fig, 2 tab, 18 ref.

Descriptors: *Tertiary treatment, *Statistical methods, *Reliability, *Treatment facilities, *Estimating, Biochemical oxygen demand, Chemical oxygen, Turbidity, Coliforms, Chlorine, Data collection, *Waste water treatment.

Statistical estimates of the long-term reliability of advanced waste treatment plants are discussed based on daily operating data covering six years of continuous operation at a waste treatment plant plus shorter records from other plants. Topics discussed include: artifacts produced by the logarithmic conversion of data, errors resulting from confusing the median with the mean when reporting data, and the probability of exceeding any finite upper limit when the performance of a plant obeys normal or lognormal statistics. The decision as to how specifications should be set is seen as being based on the effects of violations and, ultimately, on the internal cost of compliance in comparison with the external cost of violation. Examples of logarithmic plots of data are illustrated for biochemical oxygen demand, chemical oxygen demand, turbidity, coliform count, and residual chlorine. (Kreager-FIRL)
W76-12666

OPTIMIZE THE EFFLUENT SYSTEM - PART 4: APPROACH TO CHEMICAL TREATMENT,
Standard Oil Co., Chicago, Ill.
J. F. Grutsch, and R. C. Mallatt.
Hydrocarbon Processing, Vol. 55, No. 6, p 115-123, June, 1976. 18 fig, 4 tab.

Descriptors: *Oil industry, *Waste water treatment, *Colloids, *Suspended solids, *Optimization, Silica, Electrolytes, Analytical techniques, Ions, Neutralization, Chemical reactions, Sulfides, Salinity, Lagoons, Aeration.
Identifiers: *Chemical treatment.

Methods for optimizing the treatment of petroleum refinery effluents are discussed. Examples and case histories are presented for the following four collidal systems: dispersed silica, suspended matter in API separator effluent, biocolloids in fresh water aerated lagoon effluent and biocolloids in brackish water aerated lagoon effluent. Specific topics covered include: the response of colloidally dispersed silica to destabilization chemicals and an indifferent electrolyte; the comparative effectiveness of cationic polyelectrolytes for the charge neutralization of suspended matter in API separator effluents as determined by zeta potential titration curves; polyelectrolyte synergisms and antagonisms in salinity, pH, and sulfides in API separator effluents; the comparative effectiveness of cationic polyelectrolytes for the charge neutralization of biocolloids in aerated lago on effluent; and the determination of optimal chemical treatment for biocolloids in brackish waters using zeta potential measurements at low specific conductance to insure that charge neutralization is the predominant destabilization mechanism. (Kreager-FIRL)
W76-12667

OXYGEN ACTIVATED-SLUDGE SYSTEMS--I., TECHNICAL REVIEW OF THE USE OF OXYGEN IN THE TREATMENT OF WASTE WATER,
Water Pollution Research Lab., Stevenage (England).
A. G. Boon.
Water Pollution Control, Vol. 75, No. 2, p 206-213, 1976. 1 fig, 2 tab, 34 ref.

Descriptors: *Oxygen, *Sewers, *Activated sludge, *Waste water treatment, *Aerobic treatment, Biological treatment, Treatment facilities, Water quality control, Rivers, Treatment, Evaluation, Biochemical oxygen demand, Sludge, Lagoons, Nitrification.

Advantages and disadvantages associated with the use of oxygen in waste water treatment applications involving activated sludge processes, river protection, and the maintenance of aerobic conditions in rising-main sewers are discussed. Waste waters containing high biochemical oxygen demand concentrations (greater than 1000 mg/liter) can be treated very economically with oxygen activated sludge processes. Moreover, the settleability of sludge from oxygenated plants is better than that of sludge from air activated sludge plants, and the volume of surplus sludge is lower with oxygen processes. The injection of oxygen to maintain aerobic conditions in rising-main sewers is in some cases economically more advantageous than the use of air injection. Oxygen can be used to increase the oxygenation capacity of treatment plants, rivers, or lagoons in emergency situations at a lower cost than that associatd with aeration systems. Disadvantages connected with the use of oxygen include: increased complexity, increased energy consumption, difficulties associated with achieving nitrification in oxygenated activated sludge plants, and the hazards connected with storing and using oxygen. (Kreager-FIRL)
W76-12668

UK WORK ON THE USE OF OXYGEN IN THE TREATMENT OF WASTE WATER, ASSOCIATED WITH THE CCMS ADVANCED WASTE WATER TREATMENT PROJECT, (II).
Department of the Environment, London (England). Directorate General Water Engineering.
N. Banks.
Water Pollution Control, Vol. 75, No. 2, p 214-220, 1976. 8 tab, 3 ref.

Descriptors: *Activated sludge, *Oxygen, *Oxidation, *Sewage treatment, Pilot plants, On-site investigations, Biological treatment, Treatment facilities, Sludge, Nitrification, Treatment, Evaluation, Performance, *Waste water treatment.
Identifiers: United Kingdom, Settling characteristics.

Pilot plant studies dealing with the use of oxygen activated sludge treatment of waste water are reported for a number of sewage treatment facilities throughout the United Kingdom. Oxygen plants appear to be capable of carbonaceous removal at rates higher than those of air plants of comparable size, thus offering land use and cost advantages. Oxygen plants also appear to produce reduced amounts of surplus sludge, and oxygen-produced sludge possesses better settling characteristics than does air-produced sludge. Nitrification is inhibited in enclosed oxygen reactors; however, the resultant effluents can be successfully nitrified in a second stage using air. (Kreager-FIRL)
W76-12669

DEVELOPMENT IN THE APPLICATION OF OXYGEN IN THE ACTIVATED-SLUDGE PROCESS IN THE FEDERAL REPUBLIC OF GERMANY, (III).
Technische Universitaet, Munich (West Germany).
W. Hegemann, and W. Bischofsberger.
Water Pollution Control, Vol. 75, No. 2, p 221-226, 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Activated sludge, *Oxygen, *Oxidation, *Waste treatment, Sludge, Domestic wastes, Industrial wastes, Treatment facilities, Biomass, Physical properties, Evaluation, On-site investigations, Performance.
Identifiers: Sludge volume index, Settling characteristics, Oxygen activated sludge.

The treatment of domestic and industrial wastes with an oxygen activated sludge process was investigated at a number of waste treatment plants throughout West Germany. Retention periods in oxygenation tanks were shorter due to higher decay rates with oxygen activated sludge operation. Lower biomass loadings were also observed for a given tank size, implying that smaller tank volumes are possible with the oxygen activated sludge process. Specific surplus sludge production was reduced with the oxygen process, with solids production amounting to only about 50% of that associated with conventional air plants. The settleability of most oxygen sludges, as indicated by the sludge volume index, was better than that of air sludges. The oxygen process appeared to be inadequate, however, in applications where nitrification was required. (Kreager-FIRL)
W76-12670

LAGOONS AND OXIDATION PONDS, (LITERATURE REVIEW),
Black and Veatch, Kansas City, Mo.
W. J. O'Brien.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1107-1110, June, 1976. 38 ref.

Descriptors: *Oxidation lagoons, *Lagoons, *Ponds, *Biological treatment, *Waste treatment, Aeration, Mixing, Industrial wastes, Design criteria, Mathematical models, Biochemical oxygen demand, Cost-benefit analysis, Heat transfer, Zooplankton, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of paper concerning lagoons and oxidation ponds is presented. Specific subjects covered include: mixing and heat exchange in aerated lagoons, the treatment of cheese processing wastes in a two-cell aerated lagoon, design procedures for ring-shaped ponds, mathematical equations for describing the operation of aerated and facultative lagoons connected in series, comparisons of the soluble organic carbon removal in conventional single-cell anaerobic ponds and in baffled ponds, a procedure for calculating the surface area of a facultative lagoon required to obtain a desired biochemical oxygen demand reduction, an analysis of the most cost effective treatment system for upgrading the effluent from oxidation ponds, the use of isolated periodic fill and draw final basins for upgrading the effluent from conventional facultative ponds, and structural configurations that facilitate zooplankton growth in oxidation ponds. (Kreager-FIRL)
W76-12671

ANAEROBIC PROCESSES, (LITERATURE REVIEW),
Institute of Gas Technology, Chicago, Ill.
S. Ghosh, J. R. Conrad, M. Packer, and E. Van Ryzin.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1115-1137, June, 1976. 120 ref.

Descriptors: *Anaerobic conditions, *Biological treatment, *Anaerobic digestion, *Anaerobic bacteria, *Waste water treatment, Reclamation, Microbiology, Denitrification, Bicarbonates, Methane, Fermentation, Carbon, Toxicity, Industrial wastes, Kinetics, Bacteria, Pseudomonas, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A literature review of methods which utilize anaerobic processes is presented, with particular emphasis on waste water treatment. General topics covered include: microbiological and mechanistic studies, anaerobic denitrification studies, and process applications. Specific subjects discussed under the above general headings include: the isolation and identification of methanogenic bacteria, the use of labeled bicarbonate to determine the rate of bacterial methane formation, the efficiency of denitrification in

Pseudomonas denitrificans grown in glutamate-limited batch and continuous cultures, the effect of cell residence time on the kinetics and stoichiometry of bacterial denitrification, methods for removing nitrogen from primary waste water in biological reactors without the use of supplemental organic carbon, the effect of toxic industrial wastes and retention times on loading and methane production in waste water digesters, the use of anaerobic acid-phase fermentation to precondition swine manure for subsequent aerobic stabilization, and the use of anaerobic processes for energy reclamation (methane production). (Kreager-FIRL)
W76-12673

BIOLOGICAL FILTERS, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. L. Bunch.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1096-1098, June, 1976. 19 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Trickling filters, *Filtration, Model studies, Performance, Costs, Industrial wastes, Bacteria, Patents, Kinetics, Equipment, Ammonia, Nitrogen, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A review of literature dealing with biological filtration of waste water is presented, with particular emphasis on trickling filters and rotating biological contactors. Topics covered include: models for studying the performance of trickling filters, studies on the cost of trickling filter recirculation, the use of trickling filters containing a plastic medium for treating waste water from edible oil plants, studies of the growth kinetics of heterotrophic bacteria on plastic medium trickling filters, the ammonia nitrogen removal characteristics of rotating biological contactors, and patents for various waste water treatment systems employing rotating biological contactors. (Kreager-FIRL)
W76-12674

ACTIVATED SLUDGE, (LITERATURE REVIEW),
California Univ., Davis. Dept. of Civil Engineering.
E. D. Schroeder.
Journal Water Pollution Control Federation, Vol. 48, No. 6, p 1098-1107, June, 1976. 110 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Sludge treatment, *Treatment facilities, Economics, Flocculation, Nitrification, Denitrification, Phosphorus, Chemical precipitation, Anaerobic conditions, Kinetics, Oxygen, Separation techniques, Design criteria, Model studies, Aeration, Nitrogen, *Reviews, *Bibliographies.
Identifiers: *Literature reviews.

A review of literature dealing with activated sludge processes is presented. Topics covered include: a two-state microbial growth model for explaining flocculation and deflocculation processes and varying cell yields, the modeling of contact stabilization processes, dynamic process control of activated sludge and nitrification processes using activated sludge, and the relationship of trace metal deficiencies to filamentous growths in activated sludge. Design criteria for activated sludge waste water treatment plants are presented, as well as an analysis of oxygen uptake rates in reacting and nonreacting systems, studies of deep tank aeration, processes available for nitrogen removal, the construction of a nominal plug flow nitrification process, pilot plant nitrification-denitrification studies in Sweden, the involvement of luxury uptake and cationic precipitation in phosphorus removal, phosphorus release during the anaerobic treatment of sludge, the application of a centrifugal screen for removing solids in activated sludge processes, and current trends and costs for package waste water treatment systems. (Kreager-FIRL)
W76-12675

5E. Ultimate Disposal Of Wastes

DISPOSAL ALTERNATIVES FOR INTERMITTENT SAND FILTER SCRAPINGS UTILIZATION AND SAND RECOVERY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-12219

CONTAMINANT EFFECTS ON BIOTA OF THE NEW YORK BIGHT,
State University of New York at Stony Brook. MESA New York Bight Project
For primary bibliographic entry see Field 5C.
W76-12229

DETERMINATION OF THE CONDITIONS OF DISCHARGE OF SEWAGE INTO WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5G.
W76-12266

ROLE OF AGRICULTURE IN THE QUALITY OF THE NEW HAMPSHIRE ENVIRONMENT,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W76-12337

LOW-COST DISPOSAL SYSTEMS FOR FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5G.
W76-12346

SECOND NATIONAL SYMPOSIUM ON POULTRY INDUSTRY WASTE MANAGEMENT.
For primary bibliographic entry see Field 5D.
W76-12347

SURMOUNTING THE POULTRY WASTE PROBLEM,
Cornell Univ., Ithaca, N. Y. Dept. of Poultry Science.
For primary bibliographic entry see Field 5D.
W76-12348

MAINE GUIDELINES FOR MANURE AND MANURE SLUDGE DISPOSAL ON LAND.
Maine Univ., Orono. Cooperative Extension Service.
For primary bibliographic entry see Field 5G.
W76-12353

ECONOMIC EVALUATION OF LIQUID MANURE DISPOSAL SYSTEMS FOR DAIRY CATTLE,
Economic Research Service, Madison, Wis. Farm Production Economics Div.
For primary bibliographic entry see Field 5G.
W76-12357

WATER QUALITY AND WASTE DISPOSAL IN MONTANA,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-12359

YOU HAVE TO 'THINK MAINTENANCE' IN MANAGING FEEDLOT RUNOFF SYSTEMS,
For primary bibliographic entry see Field 5D.
W76-12360

WLJ PREVIEWS FIRST COMMERCIAL MANURE SYSTEM,
For primary bibliographic entry see Field 5D.
W76-12361

ANIMAL WASTE AND NITRATE MOVEMENT THROUGH SOIL,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-12362

MANAGEMENT OF RUNOFF WATER IN RELATION TO FEEDLOT OPERATIONS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5D.
W76-12365

SOIL CONSERVATION SERVICE STANDARD AND SPECIFICATIONS FOR POLLUTION ABATEMENT MEASURES FOR CONFINED LIVESTOCK OR POULTRY FEEDING OPERATIONS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W76-12367

OUTLOOKS FOR THE FUTURE OF DEEP WELL DISPOSAL,
SCS Engineers, Reston, Va.
E. T. Conrad, and N. E. Hopson.
Water Resources Bulletin, Vol 11, No 2, p 370-378, April 1975. 1 fig, 4 tab, 6 ref.

Descriptors: Wells, *Waste disposal, *Waste disposal wells, Wastes, Groundwater, *Deep wells, *Water quality standards, Water pollution control, Waste water disposal.

A rationale is presented for estimating the quantities of industrial waste that may be disposed of by deep well injection. Deep well injection refers to disposal to a saline aquifer (not a potable water supply) and does not include injection of oil field brine. Literature discussing regulation and curtailment of deep well injection of industrial wastes presents the argument that little is known about this method. Industrial wastes have been disposed of by deep well injection for less than 20 years and there are only 216 such wells in the United States, of which only 162 are currently operating. However, related experience has been gained from disposal of oil field brine by injection. There are more than 40,000 deep wells now being utilized for this purpose. The various issues are discussed in relation to the Federal Water Pollution Control Act of 1972; and estimates based on increased use of deep well injection by major industries are projected. (Skogerboe-Colorado State)
W76-12370

EVALUATION OF SOLID WASTE BALING AND BALEFILLS. VOLUME I,
Ralph Stone and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5A.
W76-12381

ALUM RECOVERY AND WASTE DISPOSAL IN WATER TREATMENT,
Metcalf and Eddy, Inc., New York. (Assignee).
For primary bibliographic entry see Field 5F.
W76-12399

CONTROLLING SURFACE WATER CONTAMINATION AT THE ESSO REFINERY AT

ANTWERP (DE BESTRIJDING VAN DE VERONTREINIGING VAN HET OPPERVLAKTEWATER IN DE ESSO-RAFFINADERIJ TE ANTWERPEN),
For primary bibliographic entry see Field 5D.
W76-12416

RECENT DEVELOPMENTS IN TANNERY EFFLUENT DISPOSAL,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
For primary bibliographic entry see Field 5D.
W76-12425

EVALUATION OF PROPOSED SEWAGE SLUDGE DUMPSITE AREAS IN THE NEW YORK BIGHT.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
Technical memorandum NOAA TM ERL MESA-11, February 1976. 212 p, 103 fig, 22 tab, ref, append.

Descriptors: *Soil disposal fields, *Sewage sludge, *Sludge disposal, Environmental engineering, Ecosystems, Water pollution, Waste disposal.
Identifiers: *Dumpsites, *Disposal procedure, *Sea bed, Coastal waters, Water columns, *New York Bight.

Presented are summaries of significant features of the New York Bight's midshelf environment and alternative sewage sludge dumpsite areas 1-A and 2-A, conclusions about the effects of dumping sewage sludge at any interim dumpsite in this environment, and specific recommendations relative to dumping operations and monitoring activities. (NOAA)
W76-12469

ULTIMATE DISPOSAL OF BIOLOGICAL SLUDGES -- A NOVEL CONCEPT,
B.C. Research, Vancouver.
E. G.-H Lee, J. C. Mueller, and C. C. Walden.
Pulp and Paper Canada, Vol. 77, No. 6 p 88-90, 92-95 (T104-110), June, 1976. 8 fig, 17 ref, 4 tab.

Descriptors: *Sludge disposal, *Activated sludge, *Pulp wastes, Biological treatment, Oxidation, Hydrolysis, Recycling, Effluents, Costs, Estimated costs, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Suspended solids, Sludge, Solid wastes, Sodium compounds, *Ultimate disposal.
Identifiers: Kraft mills, Sodium hydroxide.

The disposal of sludges from activated sludge systems involves digestion in 0.1 N NaOH for 2 hr at 50-70 C, recycling the hydrolyzate to the biosystem, and complete biological oxidation to carbon dioxide and water. Results of tests with kraft mill effluents indicate that the process reduces approximately 5-fold the amount of sludge requiring ultimate disposal. Treatment costs are estimated at $1.81/air-dry ton of pulp. Additional benefits of this process include improvement of sludge settleability and low suspended solids in clarified effluents. (Sykes-IPC)
W76-12481

THE DISPOSAL OF WASTES INTO THE SEA OF THE PROVINCE OF ROME (ITALY), (IN ITALIAN),
P. Zucchetti, M. Floccia, and G. Palmieri.
Ann Sclavo. 16(4), p 393-412, 1974.

Descriptors: *Waste disposal, Coasts, *Public health, *Water quality, *Waste treatment, *Organic wastes.
Identifiers: Rome Province(Italy).

The most important causes of the continuous increase of the amount of refuse and the negative consequences of this waste on human health and on the quality of the environment are reviewed. Modern technical advances in methods of waste treatment and disposal of organic wastes in the sea are discussed. The methods presently used in the urban coastal centers of the province of Rome for waste treatment and marine disposal are covered.--Copyright 1975, Biological Abstracts, Inc.
W76-12570

DEVELOPMENT OF RESIDUALS MANAGEMENT STRATEGIES,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 5G.
W76-12581

COLESHILL (2): INCINERATING SEWAGE SLUDGE,
Water, No. 8, p 23-24, May, 1976. 1 fig.

Descriptors: *Sludge treatment, *Sludge disposal, *Incineration, *Dewatering, *Treatment facilities, Waste treatment, Equipment, Sewage sludge, Sewage treatment.
Identifiers: United Kingdom.

A description of the Severn Trent Water Authority's sewage sludge incineration plant at Coleshill, England is provided. The plant handles sludge from sewage treatment plants in the area which amounts to about 3500 cu m/day. The sludges which contain about 95% water are initially passed through mechanically raked screens for removal of gross solids and are then directed to storage tanks where they can be held, mixed, or transferred. The sludges are next chemically treated to assist dewatering and are stirred and air-agitated to ensure thorough mixing. After conditioning, the sludge is dewatered by pressure to produce a solid sludge cake containing 65% moisture. The sludge cake is incinerated in two of three furnaces which operate at any one time. The liquid produced by dewatering is pre-treated at the incinerator so that it may be processed with normal sewage at the nearby sewage treatment plants. (See also W76-12609) (Kreager-FIRL)
W76-12610

COMPACT INCINERATOR FOR SOLID AND LIQUID WASTES.
Processing, Vol. 22, No. 5, p 33, May, 1976. 1 fig, 1 tab.

Descriptors: *Sludge disposal, *Sewage disposal, *Oil wastes, *Incineration, Waste disposal, Equipment, Solid wastes, Liquid wastes, Sludge.

A small, self-contained incinerator known as the 'Furnapak' which incorporates several design features of larger multiple hearth furnaces is available for applications involving the burning of sewage screening, oily wastes, and sewage sludges. The incinerator uses a rotating rabble shaft and air injection in a manner similar to multiple hearth furnaces. Both solid and liquid wastes can be incinerated either simultaneously or independently. Solid waste is loaded manually onto a solid bowl refractory hearth through an air-operated door large enough to accommodate standard refuse sacks. Liquid wastes and pumpable sludge are introduced into the incinerator through a tangentially mounted inlet port. Problems of burner blockage are avoided by the use of a simple weir type burner in which the fuel falling over the weir is atomized by low pressure air from the main combustion air fan. Any mixture of waste oil, oily water, sewage, and other sludges containing solids particles up to 0.5-inches in size can be handled efficiently. The incinerator is capable of feed rates up to 350 kilograms/hour for feeds containing up to 80% moisture. (Kreager-FIRL)
W76-12612

SUBMERSIBLE PUMPS UPGRADE SEWAGE HANDLING.
For primary bibliographic entry see Field 5D.
W76-12614

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),
Delaware Univ., Dept. of Civil Engineering. Newark.
For primary bibliographic entry see Field 5D.
W76-12630

SOD PRODUCTION: AN EXPERIMENT IN SLUDGE DISPOSAL,
Florida Public Works Administration, St. Petersburg.
W. T. White, Jr.
Public Works, Vol. 107, No. 6, p 104-106, June, 1976. 2 fig, 1 tab.

Descriptors: *Turf, *Sludge disposal, *Sludge, *Topsoil, *Land use, Mixing, Grasses, Tile drainage, Soil types, Ditches, Solid wastes, Moisture, Waste disposal.
Identifiers: Sandy soils, Land application, Sod production.

A project was begun in St. Petersburg, Florida, to use sludge from waste water treatment plants to develop topsoil and eventually grow sod for city parks and recreation areas. Sludge was distributed into furrows dug by a tractor and then blended with the soil using a tractor attachment. During the first yr, an 18 inch layer of topsoil was created, which produced superior grass growth when transferre to city parks and street parkways. A 23-acre area was used. The site was completely tile-drained at an average depth of 3.5 ft. The sandy soil had an interference of shell commencing at a depth of about 24 inches. The area was bordered by a 6 ft deep drainage ditch whose contents were pumped to a holding pond south of the site. Sludge solids were retained at the soil surface, part of the moisture evaporated, and any excess was collected bydrain tile and carried to the drainage ditch. Sludge spraying was discontinued for 3 days after a heavy rain, because an inch of rain contributed moisture equivalent to 3 days of operation. (Snyder-FIRL)
W76-12633

PERSISTENCE OF VIRUS ON SEWAGE-IRRIGATED VEGETABLES,
Ohio Bureau of Foods, Cincinnati. Virology Branch.
For primary bibliographic entry see Field 5B.
W76-12634

ALUM SLUDGE DRYING WITH BASIC EXTRACTIVE TREATMENT,
Resources Conservation Co., Renton, Wash.
R. L. Olson.
American Water Works Association Journal, Vol. 68, No. 6, p 321-323, June, 1976.1 fig, 2 tab.

Descriptors: *Sludge, *Drying, *Sludge treatment, *Solvents, *Organic matter, Inorganic compounds, Dewatering, Economics, Suspended solids, *Waste treatment.
Identifiers: *Basic extractive sludge treatment.

A new system has been developed to reduce problem sludges, including alum, to a dry state suitable for recycling or landfilling. The method, called B.E.S.T. (basic extractive sludge treatment), utilizes a solvent with unique properties that conditions both organic and inorganic sludges while enhancing the solids' dewatering and separation properties. The overall relative economics of the process depend on the specific sludge to be processed, the nature of existing alternatives for sludge disposal, and the availability of existing component hardware that can be incorporated into it. The process can satisfy all applicable Environ-

mental Protection Agency (EPA) guidelines. When a combination of the solvent and water is cooled below approximately 65 F, they become completely mixed, whereas suspended solids contained in a liquid mixture are easily separated mechanically. Raising the liquid temperature to approximately 140 F allows the water and solvent to be separated by decanting. A Mini-B.E.S.T. unit was tested with various sludges to test the validity of the system. All system design goals were met during this testing. When the system was tested with alum sludge, the 52% liquid remaining in the filter cake was all solvent. The solvent has an evaporative value of 135 Btu/lb as opposed to approximately 1000 Btu/lb for water, resulting in one of the major energy economies in the B.E.S.T. system. The Mini-B.E.S.T. system was able to remove over 99% of the suspended solids from an organic sludge slurry and deliver 95% or more dry, pathogen-free solids and a clear, sterile effluent. Energy requirements are relatively low and environmental impact is negligible. (Snyder-FIRL)
W76-12641

TURN SEWAGE INTO FUEL.
For primary bibliographic entry see Field 5D.
W76-12643

EFFLUENT IRRIGATION OF RYE AND RYEGRASS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-12644

PHILADELPHIA SLUDGE: WHERE TO PUT IT.
Civil Engineering-ASCE, Vol 46, No 6, p 60-62, June, 1976.

Descriptors: *Sewage treatment, *Sludge disposal, *Ultimate disposal, *Pennsylvania, *Sewage sludge, Atlantic Ocean, Land use, Oceans.
Identifiers: *Philadelphia(Penn).

Philadelphia dumps at least part of its sewage sludge in the open ocean, but the Environmental Protection Agency (EPA) has ordered it to discontinue this practice by 1981. Increased mercury, nickel, lead, and nitrate concentrations have been detected at the dumpsites. There was no apparent evidence of accumulation of organics and nutrients or changes in phytoplankton populations. Philadelphia officials believe that the dumping should not be banned. They are, however, evaluating 10 treatment-disposal alternatives. These include giving away the dried sludge for use as a fertilizer. A Recycling Center may also be set up to handle sludge for shipment. Sludge will be applied on a trial basis to farmland south of the city. Use of sludge to reclaim strip-mined lands has also been considered. Because of expected objections, Philadelphia will cooperate with several universities in studying sludge application to strip-mined land. In similar tests using Scranton sludge, the alkaline sludge helped neutralize the acidic strip-mined land and added humus. (Snyder-FIRL)
W76-12657

5F. Water Treatment and Quality Alteration

SEVERAL HYDROBIOLOGICAL PROBLEMS OF GROUND WATER STORAGE IN METROPOLITAN WATER WORKS (BUDAPEST): I, (IN GERMAN),
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
J. Szabo, G. Pusztai, G. Devai, I. Devai, and K. Gefferth.
Acta Biol Debrecina. 10/11, p 191-200, 1972/1973.

Descriptors: Europe, *Hydrobiology, *Water storage, Groundwater basins, *Water works, *Colloids, *Detritus, Municipal water, Cities, *Silts, *Design, Maintenance, Treatment facilities.
Identifiers: Budapest(Hungary), Colloids.

Plans are discussed for the optimum design and maintenance of a purification basin to prevent the transfer of fine silt, organic and inorganic colloids and detritus to the storage basin, since this is the cause of its occasional blockage.--Copyright 1975, Biological Abstracts, Inc.
W76-12258

A NEW STANDARD 'DRINKING WATER' (GOST 2874-73) AND ITS SCIENTIFIC BASIS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5G.
W76-12317

PRELIMINARY STUDIES OF ASBESTIFORM FIBERS IN DOMESTIC WATER SUPPLIES,
California Univ., Berkeley.
For primary bibliographic entry see Field 5A.
W76-12325

HYGIENIC EVALUATION OF ELECTRODIALYSIS WATER DESALINATION SET UP, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene; and Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5D.
W76-12394

ALUM RECOVERY AND WASTE DISPOSAL IN WATER TREATMENT,
Metcalf and Eddy, Inc., New York. (Assignee).
G. P. Fulton.
U. S. Patent No. 3,959,133, 4 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1739, May 25, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Treatment facilities, Sludge treatment, Sludge disposal, Suspended solids, Coagulation.
Identifiers: *Alum(Aluminum sulfate) recovery.

In water treatment plants, particularly for large municipalities, alum (aluminum sulphate) is commonly used in the coagulation and clarification process. During the treatment the alum is converted essentially to aluminum hydroxide. The aluminum hydroxide, together with suspended solids including suspended matter in the raw water, precipitates resulting from the treatment process, additives, etc form a sludge which must be disposed of. The invention is directed to the provision of a water treatment system and process which normally utilizes alum recovery and yields a neutral cake for convenient disposal, provides for periodic elimination of contaminated recovered alum, and permits operation without alum recovery when required by abnormal conditions. (Sinha - OEIS)
W76-12399

APPARATUS FOR BIOLOGICAL AND CHEMICAL PURIFICATION OF WATER BY AGGLOMERATION,
Agrotechnika, narodny podnik, Zvolen (Czechoslovakia). (Assignee).
S. Mackrle, and V. Mackrle.
U. S. Patent No. 3,959,144, 5 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1743, May 25, 1976.

Descriptors: *Patents, *Water purification, Water quality control, *Biological treatment, Chemical reactions, Flocculation, *Separation techniques, *Water treatment, Waste water treatment, Equipment.
Identifiers: *Chemical treatment, *Separation tanks.

A water purification plant composed of standard elements is arranged in such a way that all the spaces are formed for either chemical or biological water purification. The arrangement is composed of at least two tanks with substantially cylindrical mantles aligned side by side horizontally and with their axes parallel. Adjacent tanks, whose length is larger than their diameter, are mutually connected by inclined walls placed tangential to the mantles of the tanks. Inclined walls, adjacent upper parts of the mantles of the tanks and front and rear walls determine a separating space for the separation of the floccular suspension from the purified water. (Sinha - OEIS)
W76-12401

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC FLUSHING,
Desalination Systems, Inc., Escondido, Calif. (Assignee).
For primary bibliographic entry see Field 5D.
W76-12402

TECHNIQUE FOR CONTINULUSLY ANALYZING THE CONCENTRATION OF OZONE DISSOLVED IN WATER,
Fischer and Porter Co., Warminster, Pa. (Assignee).
J. J. Morrow, and L. L. Dailey.
U.S. Patent No. 3,960,673, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 294, June 1, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Water pollution treatment, *Ozone, Disinfection, Oxidation, *Monitoring, Measurement, Instrumentation, Cathods, Anodes, Pollutant identification.

Ozone is extensively used in the purification of drinking water, the treatment of sewage and industrial wastes, as well as in various chemical manufacturing processes. To attain an effective germicidal action serving to destroy pathogens and all harmful bacteria and to react with oxidizable organic or inorganic chemical traces present in water, it is essential that the ozone concentration be in a predetermined range, such as 0.1 to 1 ppm. Below this range, the concentration is inadequate for its intended purpose. A technique is described for continuously indicating the concentration of ozone dissolved in water. Use is made of an amperometric cell, preferably formed of a gold cathode concentrically placed within a tubular copper anode to define an annular passage, the cathode being rotated at high speed. A sample stream of water is directed through the passage at a predetermined flow rate whereby in the absence of dissolved ozone, the cathode is polarized, but in the presence of it, depolarization takes place to cause a current to flow in the cell. The current is measured to provide a reliable and continuous reading of ozone concentration. (Sinha-OEIS)
W76-12405

WATER QUALITY OBJECTIVES.
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
For primary bibliographic entry see Field 5G.
W76-12588

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE WATER SUPPLY AND WASTEWATER SYSTEM, USING NONLINEAR PROGRAMMING,
California Univ., Los Angeles.
M. E. Mulvihill.

Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 73-18641. Ph. D. Thesis, 1973, 134 p.

Descriptors: *Mathematical models, *Water supply, *Waste water treatment, Water reuse, Planning, Water quality, Algorithms, Linear programming, *Water treatment, Model studies, Optimization.

A mathematical model of a conjunctive urban water supply and waste water system, consisting of the minimization of a concave objective function subject to linear constraints, has been formulated and applied to the City of Los Angeles. The objectives are: to minimize the cost of supplying water from several sources, including the provision for recycling reclaimed water; and, to determine the capacity expansion schedule of the water and waste water treatment processes. A multilevel solution technique is developed to determine the minimum cost alternative for a selected planning horizon. The first level of the algorithm is an iterative process in which the objective function is successively linearized and a series of linear programs is solved. When this yields no improvement, the second level, a search of neighboring extreme points, is initiated. If there is an improvement at this level, the procedure returns to the first level and continues. The model and solution technique were successfully applied to an actual case and the results can be used as an aid in the comprehensive planning of the system. The mathematical model is flexible in that it can be expanded to include additional water quality constituents, advanced waste water treatment processes, and variations in water quality standards. (Sandoski-FIRL)
W76-12621

ALUM SLUDGE DRYING WITH BASIC EXTRACTIVE TREATMENT,
Resources Conservation Co., Renton, Wash.
For primary bibliographic entry see Field 5E.
W76-12641

5G. Water Quality Control

THE WINOOSKI WORKSHOPS: AN ASSESSMENT OF SPECIFIED WORKSHOP TECHNIQUES FOR STIMULATING AND IMPROVING PUBLIC INVOLVEMENT IN WATER RESOURCES,
Vermont Univ., Burlington. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W76-12151

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
For primary bibliographic entry see Field 2L.
W76-12200

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS, PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART I: PHOTOSYNTHETIC PRODUCTION AND ENERGY CONVERSION IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12213

A LIMNOLOGICAL STUDY OF SPIRITWOOD LAKE, N. D., WITH SPECIAL EMPHASIS ON ITS WATER QUALITY, SEASONAL CYCLES OF CHEMICAL NUTRIENTS PHYTOPLANKTON, ZOOPLANKTON AND PRIMARY PRODUCTION, PART II: CAUSES AND CONTROL OF ALGAL BLOOMS IN SPIRITWOOD LAKE, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-12214

ECONOMIC COSTS OF CONTROLLING WATER QUALITY THROUGH MANAGEMENT OF IRRIGATION RETURN FLOWS,
Washington State Univ., Pullman. Coll. of Agriculture.
G. H. Pfeiffer, and N. K. Whittlesey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 517, $4.50 in paper copy, $3.00 in microfiche. Completion Report, August 1976. 58 p, 6 fig, 16 tab, 17 ref. OWRT B-059-WASH(2). 14-31-0001-5125.

Descriptors: Economics, *Water quality control, Irrigation, *Return flow, Nitrogen, Water temperature, Sediments, *Water management(Applied), Model studies, *Alternative costs, Water policy, Cost analysis, *Pollution abatement.

This study focuses on the economic and social costs of alternative policies that could be used to control water quality through management of irrigation return flows. Three environmental quality parameters associated with irrigated agriculture were singled out for analysis. These parameters were river water nitrogen concentration, river water temperature and loss of sediment from irrigated farms. A dual simulation and linear programming model was used as the vehicle of analysis. Policies considered for analysis included taxing water and nitrogen inputs, reducing water rights, and improved management techniques. Results indicated that improvement of water quality in the study area is possible through the control of agricultural inputs and activities. Improvement of the receiving water to a point suitable for most uses could reduce farm income 16 to 41 percent, depending on the policy employed. A trade-off existed between economic efficiency and distribution of abatement costs. Policies that relied on higher input prices for rationing tended to more efficiently allocate resources than policies that set arbitrary input use quotas. However, these more efficient policies having low total social costs also imposed higher costs on agriculture. The results indicate that considerable improvement in water quality is possible, perhaps 50 percent of that desired, at very little cost to agriculture or the public. Better management and more efficient irrigation methods could achieve this level of abatement very cheaply. Higher levels of abatement, however, become very expensive.
W76-12218

COASTAL ENGINEERING CONFERENCE. FOURTEENTH. PROCEEDINGS. COPENHAGEN, DENMARK, JUNE 24-28, 1974.
American Society of Civil Engineers, New York.
Coastal Engineering Conference. Fourteenth. Proceedings. held in Copenhagen, Denmark, June 24-28, 1974. 3 Volumes, 2580 p.

Descriptors: *Coasts, Engineering structures, Sediments, Sedimentation, Resources development, Water resources, Exploration, Exploitation, Environmental effects.
Identifiers: *Outer Continental Shelf, Environmental impact.

This collection of papers in three volumes constitute the proceedings of the 14th Coastal Engineering Conference held in Copenhagen, Denmark, June 24-28, 1974. The Conference was sponsored by Coastal Engineering Research Council and Waterways, Harbors, and Coastal Engineering Division, American Society of Civil Engineers; Ministry of public Works of Denmark; Danish Hydraulic Institute; Institute of Hydrodynamics and Hydraulic Engineering, Technical University of Denmark; and Danish Society of Civil Engineers. The papers are arranged by the following subject groupings: Theoretical and observed wave characteristics; Coastal sediment problems, Coastal Structures and related problems; and Coastal, estuarine and environmental problems. Pertinent papers are separately abstracted. (See W76-12222 and W76-12223) (Sinha-OEIS)
W76-12221

ENVIRONMENTAL ANALYSIS FOR BAHAMAS SUPERTANKER PORT,
Erindale College (Ontario).
W. Harrison.
In: Coastal Engineering Conference. Fourteenth. Proceedings, held in Copenhagen, Denmark, June 24-28, 1974, Vol III, Chap. 151, p 2551-2567, 1974. 9 fig, 11 ref.

Descriptors: *Environmental effects, *Oil spills, *Oil pollution, Water resources, *Resources development, Continental Shelf, Ports, Winds, Currents(Water), Aquatic drift, Atlantic Ocean, Water pollution sources.
Identifiers: *Outer Continental Shelf, *Superports, Supertankers, Wind effects, *Bahama Islands.

From the point of view of the Bahamian environment, the most favorable locations for a supertanker port are the western margin of the Great Bahama Bank; the western shores of Grand Bahama Island; and the western margin of Little Bahama Bank. A port in any of these areas would (1) usually be located down-wind and down-current of the majority of Bahamian islands and shallows, (2) be located adjacent to boundary currents, especially the Florida Current, that would tend to carry large accidental oil spills away from coastal areas and into the North Atlantic, and (3) be located where wave energies would be relatively low, and (4) be positioned close to sea-lanes, obviating supertanker penetration of the central Bahamas. A site 30 miles east of Freeport, Grand Bahama Island, was chosen for construction of a sea-island supertanker bunker. Six controlled spills (270 U.S. gals. each) of crude and two spills of naptha were made at the sea-island site during the windiest month (February). Slick spreading rates are presented. Cumene and all lower-boiling aromatics disappeared within the first 90 minutes after a crude-oil spill; a majority of toxic fractions (BP < 220 deg C) disappeared within 3 to 8 hours. Slick-drift roses for extreme-wind-persistence and strongest-coastal-current conditions indicate the environmental suitability of the site for capture and cleanup of small spills (< 1000 gal.). (See also W76-12221) (Sinha-OEIS)
W76-12222

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH A PIPELINE LANDFALL IN COASTAL DUNES AT CRUDEN BAY, ABERDEENSHIRE, SCOTLAND,
Aberdeen Univ. (Scotland).
W. Ritchie.
In: Coastal Engineering Conference. Fourteenth. Proceedings, held in Copenhagen, Denmark, June 24-28, 1974, Vol III, Chap. 152, p 2568-2580, 1974.

Descriptors: *Environmental effects, *Pipelines, *Resources development, Water resources, *Oil industry, Continental Shelf, Coasts, Bays, Dunes, Beaches.
Identifiers: *Outer Continental Shelf, Environmental impact, North Sea, Scotland, Pipeline landfall.

The first oil pipeline from the North Sea area reached Scotland in 1973. The landfall, at Cruden Bay, Aberdeenshire, is a sediment-filled, bay-head beach with coastal dunes. Environmental and landscaping problems arose with the trenching of the beach and dune areas. Various methods, including flexible fence construction, spraying with

a bitumen compound and spreading of soil over vulnerable areas, protected the site successfully. Full revegetation took place later and the beach and dune area are now restored to their original condition. Environmental management techniques were designed to preserve the high amenity and ecological status of the site and minimise the risk of side-effects, both during and after engineering work. (See also W76-12221) (Sinha-OEIS)
W76-12223

OCEAN 72, IEEE INTERNATIONAL CONFERENCE ON ENGINEERING IN THE OCEAN.
Institute of Electrical and Electronics Engineers, Inc., New York.
Ocean 72, IEEE International Conference on Engineering in the Ocean, held Newport, Rhode Island, September 13-15, 1972. 613 p.

Descriptors: *Resources development, Water resources, *Water quality control, *Environmental effects, *Pollution, *Instrumentation, *Engineering, Continental Shelf, Tidal power, Biology, Remote sensing, Models, Acoustics, Data processing, Nuclear powerplants, Navigation, Optics, Underwater, Sediments, Materials, Exploration, Seismic properties.
Identifiers: *Outer Continental Shelf.

This collection of papers constitutes the proceedings of the conference on Engineering in the Ocean held at Newport, Rhode Island, September 13-15, 1972. Papers are grouped according to the following subjects: Signal Processing; Tidal Power; Marine Bio-Electronics; Project Sanguine; Electromagnetic Remote Sensing; System Modeling and Optimization; Underwater Acoustics; Magnetic and Electromagnetic Methods; Data Collection and Reduction; Pollution Measurements; Offshore Nuclear Generating Stations; Navigation, Positioning and Tracking; Instrumentation; Underwater Optics; Sediment Properties and Seismic Profiling; and Materials. (See W76-12225) (Sinha-OEIS)
W76-12224

ENVIRONMENTAL CONSIDERATIONS OF OFFSHORE GENERATING STATIONS,
Public Service Electric and Gas Co., Newark, N.J.
J. R. Roney.
In: Ocean 72, IEEE International Conference on Engineering in the Ocean, held Newport, Rhode Island, September 13-15, 1972. p 419-421, 2 ref.

Descriptors: *Offshore platforms, *Environmental effects, *Resources development, Water resources, *Nuclear powerplants, *Thermal pollution, Continental Shelf, Biota, Ecosystems, Breakwaters, Model studies, Radiation, Monitoring, Planning.
Identifiers: *Outer Continental Shelf, *Environmental impact, Artificial reefs.

The environmental considerations and the supporting program of studies for the offshore nuclear generating station is described and some of the anticipated environmental effects of the plant are discussed. A large amount of on-site investigation, laboratory experiments, and analysis is being carried out as a basis for an accurate prediction of the environmental impact. Physical models of the breakwater are being tested for wave effects. An on-site ecological survey is including sampling of the marine biota on an extensive scale. A prediction of the thermal effluent release pattern is being conducted by both computer model and physical modeling. An oceanographic survey is measuring currents, temperatures, etc. Measurement of the existing natural background of radiation will be conducted. No adverse effects on the environment are predicted from studies conducted so far. (See also W76-12224) (Sinha-OEIS)
W76-12225

SOME CAUSES OF ANOMALIES IN OXYGEN MASS TRANSFER IN POLLUTED WATER, (IN RUSSIAN),
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Wood Chemistry.
For primary bibliographic entry see Field 5D.
W76-12265

DETERMINATION OF THE CONDITIONS OF DISCHARGE OF SEWAGE INTO WATERS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
V. M. Prusakov, and I. A. Voronova.
Gig Sant. 38(7), p 65-66, 1973.

Descriptors: *Water quality standards, Regulation, Waste disposal, *Sewage disposal, Lethal limit, *Toxicity, Water pollution control.
Identifiers: *Maximum allowable concentrations, *USSR.

The main document (USSR) on the basis of which the sanitation engineer determines the conditions of sewage discharge into waters is the Regulations for Preservation of Surface Waters. The list of maximum allowable concentrations contained should be supplemented by a list of threshold concentrations expressed in fractions of the maximum allowable concentrations. In the case of the simultaneous content of substances in sewage with the same or close concentrations, the limiting index of harmfulness for each substance is that which requires a maximum decrease of the maximum allowable concentration. The effect of summation of the threshold concentrations should be considered.--Copyright 1975, Biological Abstracts, Inc.
W76-12266

A STOCHASTIC MODEL FOR PREDICTING THE PROBABILITY DISTRIBUTION OF THE DISSOLVED-OXYGEN DEFICIT IN STREAMS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-12276

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
A. G. Lamonds, and M. L. Merritt.
Water-Resources Investigations No 76-23, February 1976. 189 p, 37 fig, 29 tab, 44 ref.

Descriptors: *Water pollution sources, *Canal construction, *Baseline studies, *Water quality, *Florida, Environmental effects, Surface waters, Groundwater, Aquifers, Seepage, Water table, Data collections, Evaluation.
Identifiers: *Cross-Florida barge canal.

This route of the partly completed Cross-Florida Barge Canal follows the St. Johns, Oklawaha and Withlacoochee Rivers. If the canal is completed, the Summit Reach, connecting the Oklawaha and Withlacoochee Rivers will be excavated into the Floridan aquifer. Large springs that discharge from this limestone and dolomite aquifer flow to the Oklawaha and Withlacoochee Rivers. These streams and the aquifers in much of the area contain a calcium bicarbonate water which has an average dissolved solids concentration of less than 300 mg/liter and generally is suitable for most uses. Dense groths of aquatic plants in Lake Ocklawaha and Lake Rousseau, existing impoundments for the Barge Canal, have caused large diel variations and stratification of dissolved oxygen. Problems of canal construction on the quality of water include increased turbidity and suspended sediment concentrations during dredging and land clearing operations. The impoundment of Eureka Pool in the Oklawaha River will probably result in increased aquatic plant production and large variations in dissolved oxygen concentrations similar to those in Lake Ocklawaha. In some parts of the canal, canal water will move into the aquifer, so the quality of ground water in those places will depend partly upon the quality of water in the canal. Seepage from the canal to the aquifer is expected to be larger in the Summit Reach than in any other reach. (Woodard-USGS)
W76-12283

THE EXTENT OF HAZARD AND THE HYGIENIC STANDARDIZATION OF ISOPHTHALONITRILE IN BODIES OF WATER, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W76-12286

DEVICE FOR AERATING WATER BODIES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
V. M. Karasik, and I. I. Stovbun.
Gidrobiol Zh. 10(6), p 108-111, 1974.

Descriptors: *Aeration, Algae, *Cyanophyta, Design, Treatment facilities, Water pollution control, Pollution abatement, Design criteria, Operations.

A design for an aeration plant for water bodies is proposed and its zone of effective action established. The parameters and operating regime of the aeration plant needed for suppressing the activity of blue-green algae were determined. The plant is recommended for small water bodies (up to 50 ha) with a depth of 5 m.--Copyright 1975, Biological Abstracts, Inc.
W76-12311

A NEW STANDARD 'DRINKING WATER' (GOST 2874-73) AND ITS SCIENTIFIC BASIS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
S. N. Cherkinskii.
Gig Sanit. 6, p 7-11, 1974.

Descriptors: *Potable water, *Water quality standards, *Bacteria, *Coliforms, Organoleptic properties, Nitrates, Ions, Chlorides, Phosphates, Iron, Sulfates, Manganese, Aluminum, Arsenic, Lead, Toxicity.
Identifiers: Acrylamide, Beryllium, Fluorine, Molybdenum, Selenium, Silver, Strontium, *USSR.

The composition and properties of drinking water must meet certain standards concerning the degree of total bacterial contamination and content of coliform bacteria, harmlessness of the chemical composition and its favorable organoleptic properties. The previous standard specified permissible levels of only 3 toxic substances found in natural water (As 0.05 mg/l, Pb 0.1 mg/l and F 1.5 mg/l). Five additional substances are specified in the new standard (Be 0.0002 mg/l, Mo 0.5 mg/l, Se 0.001 mg/l, Sr 2 mg/l and nitrates (with respect to N) 10.0 mg/l), and flocculant polyacrylamide (2 mg/l) and Ag ions (0.05 mg/l) are specified for the 1st time. The new standard also specifies dry residue content of not more than 1000 mg/l, chlorides 300 mg/l, sulfates 500 mg/l, Fe 0.3 mg/l, Mn 0.1 mg/l, residual Al 0.5 mg/l and polyphosphates 3.5 mg/l.--Copyright 1975, Biological Abstracts, Inc.
W76-12317

PHOSPHORUS DEFICIENCY IN CATTLE FROM THE BRASILIA REGION OF BRAZIL, (IN PORTUGESE),
Departamento de Pesquisas e Exp., Brasilia (Brazil).
M. D. S. Dayrell, J. Doebereiner, and C. H. Tokarnia.

Pesqui Agro Pecu Bras Ser Vet. 8(6), p 105-114, 1973.

Descriptors: *Phosphorus, *Cattle, South America, *Grasses, Water pollution control.
Identifiers: Aristida-Sp, Brasilia, *Brazil, Hyparrhenia-Rufa, Melinis-Minutiflora.

Young male cattle were studied under range conditions in 4 'cerrado' areas of Brazilia (Sobradinho, Planaltina, Formosa and Luziania) for a period of 14-21 mo. Serum Pi values were determined at monthly intervals during this period. At the same time analyses of P in grass samples of Melinis minutiflora, Hyparhenia rufa and Aristida sp., were carried out, as well as soil analyses. The results of the serum Pi estimations from cattle in the areas of Sobradinho and Planaltina were in agreement with the herd histories, which indicated that the Sobradinho area was not deficient in P and that the Planaltina area was deficient in P. In the areas of Formosa and Luziania, the serum Pi levels were intermediate, and also in agreement with the herd histories, which indicate a moderate P deficiency. There was a significant correlation between the P values in the blood serum and the value of the 3 grass species with the exception of the area where there was the most severe P deficiency. There was a correlation between the P values of the soil and the yearly average serum Pi value of the cattle from all 4 areas. No correlation was found between rainfall and Pi levels in the blood serum in P deficient areas, but in the area where there is no P deficiency there was a close correlation between increased rainfall and increased Pi in the blood serum.--Copyright 1975, Biological Abstracts, Inc.
W76-12322

ROLE OF AGRICULTURE IN THE QUALITY OF THE NEW HAMPSHIRE ENVIRONMENT,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. D. Harter.
Presented at Conference on Agricultural and Processing Wastes in the Eastern Region: A Perspective, Philadelphia, Pennsylvania, December 1-3, 1970, p. 78-83. 2 tab.

Descriptors: *Farm wastes, Oxidation lagoons, Waste treatment, *Agriculture, *Environment, *New Hampshire, *Cattle, *Waste disposal, Lagoons, Swine, Poultry, Water pollution control, Odor.

The majority of New Hampshire's land area is too hilly to support an economically viable agricultural operation. A large portion of the remaining area is too wet to farm. Fruit and vegetable farming has been of minor importance. But the steady increase in tourism is encouraging roadside vegetable stands. New Hampshire has a minor animal industry when compared to many states. Sheep are largely confined to the hillier less populated regions of the state. Hog production is scattered across the state, a few hogs to a farm. Poultry production is nearer populated areas and is often accompanied by odor problems. Cattle contribute appreciably to the agricultural waste problem. Waste produced by cattle is roughly equivalent to that produced by the entire human population of the state. Mass waste disposal systems are uneconomical because few dairy herds exceed 100 head, and the majority are less than 30 head. Although oxidation ponds are more acceptable than lagoons, the structure still has generally not been acceptable as a waste disposal method. The New Hampshire Cooperative Extension Service personnel are meeting with farmers and are educating them to the role they must undertake. This service has been the most important single factor in the control of pollution from agricultural sources. (Cameron-East Central)
W76-12337

EVALUATING A LOW-ENERGY, HIGH-VOLUME PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOONS BY MIXING,
Oklahoma State University, Stillwater. Dept. of Agricultural Engineering.
C. E. Rice.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 777, $3.50 in paper copy, $3.00 in microfiche. Completion Report, (1976). 19 p, 7 fig, 1 tab, 2 ref. OWRR A-051-OKLA(1).

Descriptors: Lagoons, Odor, *Mixing, Gases, Reservoirs, Waste water treatment, Biochemical oxygen demand, *Farm wastes, Pumps, Livestock, Conductivity, Chemical oxygen demand, *Farm lagoons, Oxidation lagoons.
Identifiers: *Anaerobic lagoons, *Propeller pumps, *Odor reduction.

A low-energy, high-volume propeller pump was placed in a lagoon receiving manure material from a confined housing with pit collection swine production operation to evaluate its effectiveness in the reduction of offensive odors from the lagoon. The retention time in the pits was 26 days or greater. Another lagoon of the same size (0.405 hectare surface area by 2.2 m deep), subject to similar conditions, was close by and provided a comparison of a treated (lagoon with pump) system with an untreated (lagoon without pump) system. The lagoons were anaerobic, very turbid and had no dissolved oxygen. The pump could completely mix the lagoon liquid about every four hours and it was operated from July 17, 1975 through Jauary 6, 1976. COD, BOD5, DO, pH, temperature, conductivity and general observations were obtained on a weekly basis beginning two weeks before start-up of the pump and through May, 1976. The observed results for the treated and untreated systems followed the same pattern. This indicated that the pump was not having a significant effect on the lagoon. The major difference observed was that the boiling activity, caused by the release of accumulated gases from the lagoon to the atmosphere, of the treated lagoon was reduced significantly compared to the untreated lagoon.
W76-12344

LOW-COST DISPOSAL SYSTEMS FOR FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
N. P. Swanson, and C. L. Linderman.
Agricultural Engineering, Vol. 55, No. 11, p 20-21, November, 1974. 3 fig.

Descriptors: *Agricultural runoff, *Feed lots, Disposal, *Costs, Irrigation, *Waste disposal, *Farm wastes, Sprinkler irrigation, Percolation, Waste treatment.

Cattle feeders are required by law to control runoff from their feedlots. The most practical method for disposing of runoff is land disposal through irrigation. The feeder needs a low-cost disposal system that is fitted to a minimum land area. The Soil Conservation Service recommends a disposal area 1 1/2 to 2 times larger than the contributing feedlot, but the specific area needed for disposal to empty the holding pond at any one time should be no longer than the feedlot. The runoff may be disposed of by a gravity flow system or through sprinkler irrigation. Gravity disposal through gated pipe, hoses, or single point discharge may require land preparation, some form of pump, protection from freezing, and it may require more labor. Sprinkler distribution requires more power, may require a reuse pit due to the runoff caused by the distribution, and may cause excess wetting during the seedling stage or just before harvest, thus damaging crops. Care must be taken in selecting irrigation components and in scheduling field applications. The larger the system, the more consideration should be given to application and distribution efficiencies. The most important considerations for smaller systems are low investment and labor costs. With either type, care must be taken to avoid ponding and mosquito breeding. Also the area should be located to take advantage of prevailing winds to avoid odor build-up near residences. (Merryman-East Central)
W76-12346

LITTLE POLLUTION FROM THIS FEEDLOT.
Agricultural Research, Vol. 19, No. 6, p 10-11, December, 1970. 2 fig.

Descriptors: *Feed lots, *Nebraska, Analysis, Nitrates, Gases, Nitrification, Climates, *Farm wastes, Water pollution control.
Identifiers: Manure pack.

The results of an investigation concerning nitrate pollution of a shallow groundwater table, conducted on a flat cattle feedlot in Nebraska, are discussed. The 120-by-305 ft. lot was chosen for study because of such conditions as: stocking rate of 400 sq. ft. per animal; little manure removal; highly permeable soil; fluctuating high-water table; and little surface drainage. Observations and measurements indicated that the manure pack (nearly 1 ft. thick) and the soil and manure form a common interface that effectively bars water movement. Analysis of soil core samples showed that downward movement of nitrates and other forms of nitrogen in the soil is minor. Promotion by interface of aerobic conditions in the pack and anaerobic conditions below the interface leads to generation of nitrates by nitrification in the aerobic zone, while breakdown by denitrification occurs in the anaerobic zone. Biological activity in the two zones creates gaseous compounds such as ammonia, carbon dioxide, and amines, which are dispersed into the atmosphere. Seven wells were installed in and around the lot to obtain water samples and water table depth measurements. Water samples were taken periodically from wells next to the feedlot and analyzed. The estimates indicated that 20 to 40 percent of Nebraska cattle feeding operations are on flat, permeable soil. The measurements indicated that considerable amounts of solid wastes can be removed simply by decomposition on the lot. These field observations are supported by results of laboratory studies. (East Central)
W76-12350

KEEPING RUNOFF SAFE.
Agricultural Research, Vol. 21, No. 10, p. 8, April, 1973. 3 fig.

Descriptors: *Agricultural runoff, *Rainfall, *Feed lots, Groundwater, Infiltration, Solid wastes, *Farm wastes, Water pollution control, Pollution abatement.

Continuing research is showing how and when Great Plains cattle feedlots may contribute to water pollution and is demonstrating that, with adequate control of runoff, feedlots can be acceptable neighbors. In cooperation with the Nebraska Agricultural Experiment Station, studies are being made of how rainfall, snow, temperature, and evaporation affect pollution from sloping feedlots. These studies show that widespread contamination of ground water by infiltration from the feedlot surface is improbable. The research indicates that feedlots should be designed to restrict surface runoff, which may transport heavy loads of pollutants. The amount of solids transported in runoff may be less from a feedlot than from tilled bare soil. Snowmelt runoff may transport 10-12 times the amounts of solids removed in rainfall from the same feedlot, and the COD will thus be correspondingly higher. The potential pollution hazard from a particular feedlot can be determined only by study of the watershed of which it is a part--its hydrologic characteristics and its proximity to surface water sources. (Cameron-East Central)
W76-12351

MAINE GUIDELINES FOR MANURE AND MANURE SLUDGE DISPOSAL ON LAND.
Maine Univ., Orono. Cooperative Extension Service.
Miscellaneous Report 142, The Life Sciences and Agricultural Experiment Station and the Cooperative Extension Service, University of Maine, Orono, 1972, 21 p. 2 fig, 11 tab.

Descriptors: *Sludge disposal, *Maine, Nitrogen, Lagoons, Irrigation, Landfills, *Farm wastes, Waste disposal, *Water quality standards, Recycling, Dehydration.
Identifiers: *Land spreading, Composting.

This standard is concerned with conditions for: (1) total recycling of nutrients through planned crop production; (2) disposing of excess manure on the land by spreading; (3) piling on the land; (4) bulk burying in landfill; (5) composting; (6) lagoon treatment with sludge and liquid disposal; (7) disposal by irrigation; and (8) dehydrated manure disposal. Maximum rates for spreading manure on land and for other methods were developed from the physical and chemical characteristics of each individual soil, and from the available knowledge of the movement of manure liquids and residues on and through each soil type. The limiting factor in determining application rate is the pounds of nitrogen per acre to be applied. An extensive table is given summarizing the permissible disposal practices and maximum manure application rates for several Maine soils. (East Central)
W76-12353

RELATING AGRICULTURAL INSTRUCTION TO ENVIRONMENT IMPROVEMENT: THE ROLE OF LAND AND SOIL,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
W. H. Fuller.
Journal Paper No. 1854, Arizona Agricultural Experiment Station, University of Arizona, 1971, p. 69-72. 4 fig, 1 ref.

Descriptors: *Soils, *Waste disposal, *Oceans, *Water pollution, *Soil contamination, Fertilizers, Soil conservation, Organic matter, Carbon dioxide, Bacteria, Nutrients, Municipal wastes, Nitrogen, Phosphorus, Sulfur, *Farm wastes, *Education, *Training.
Identifiers: *Agricultural instruction, *Land disposal.

For many years warnings have been issued that man's waste disposal problem should be controlled before it gets out of hand. In the past these warnings were ignored, but today many people are working to slow down the pollution of the environment. Pollution usually ends up in either the soil or ocean. Resistance to polluting the ocean has thrown most of the burden of waste disposal on the soil. Pollution can be controlled through the soil because it is an excellent digester of wastes. The soil decomposes organic matter. It produces nitrogen and sulfur through complex microbial cycles which are initiated by organic material, and the end product of most waste is carbon dioxide, water, and humus. What is needed is knowledge of how to use these wastes to benefit the soil, and this should begin in the colleges. Courses should be developed to make people aware of the problems and the solutions. (Russell-East Centrai)
W76-12354

ECONOMIC EVALUATION OF LIQUID MANURE DISPOSAL SYSTEMS FOR DAIRY CATTLE,
Economic Research Service, Madison, Wis. Farm Production Economics Div.
N. D. Kimball, L. V. Lenschow, and R. E. Rieck.
Bulletin R2199, College of Agricultural and Life Science, University of Wisconsin, Madison, August, 1970, 24 p. 8 fig, 5 tab.

Descriptors: *Liquid wastes, *Waste disposal systems, *Economics, *Costs, *Dairy industry, Waste storage, Equipment, Facilities, Labor, *Wisconsin, Water pollution control, *Farm wastes, Waste treatment.

Experiences are described of Wisconsin dairy farmers who installed liquid manure disposal systems. These liquid manure systems include: (1) free-stall, all liquid (2) free-stall, liquid-conventional, (3) stanchion, all-liquid, (4) stanchion liquid-conventional. Comparisons are made of liquid manure storage, facility, investments, annual costs, and costs and returns analysis. The most economical manure-handling system depends on many variables. The net disposal costs depend upon both the value of the manure and the cost of disposing the excrement. By changing the amount on nitrogen, phosphorus, and potassium recovered and making different assumptions regarding operating and ownership costs, the optimum system of manure disposal would change. In addition, installation costs are only the out-of-pocket costs--farmers did not report a charge for their own labor. Therefore, each farmer must ask himself whether the assumptions used in this study agree with his particular situation and then interpret the results accordingly. (Merryman-East Central)
W76-12357

BEEF FEEDLOTS - A POLLUTION PROBLEM,
Agricultural Research Service, Lincoln, Neb.
C. B. Gilbertson.
Proceedings of Agriculture and Pollution Seminar, University of Arizona, Tucson, February 19, 1971, EES Series Report No. 35, p. 18-29. 5 tab, 19 ref.

Descriptors: *Feed lots, *Management, *Water pollution sources, *Air pollution, *Waste disposal, Climates, Agricultural runoff, Chemical properties, *Farm wastes, Livestock, Water pollution control, Pollution abatement.

The waste produced by the livestock feeding industry creates a pollution problem for management. The management of feedlot is affected by physical characteristics of the feedlot, climatic conditions, animal size, animal density and the type of ration fed. Livestock wastes are potential pollutants of (1) surface water, (2) ground water, (3) air, and (4) aesthetic values. Each of these problems is discussed. The primary problem in feedlot management is the need for acceptable pollution-free waste management schemes to replace waste disposal systems. An acceptance of an available method rather than research-backed recommendations is the reason for existing waste management practices. (Kehl-East Central)
W76-12358

WATER QUALITY AND WASTE DISPOSAL IN MONTANA,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-12359

SOIL CONSERVATION SERVICE, TEXAS TECH UNIVERSITY WORKSHOP COMMITTEE ON FEEDLOT WASTE.
Soil Conservation Service, Temple, Tex.
Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 44 p. 9 fig, 6 tab, 7 ref.

Descriptors: *Farm wastes, *Feed lots, Water quality, Water pollution, Waste disposal, Design criteria, Pollution abatement, *Waste treatment, Water pollution control.

Presentations were made dealing with the state laws and procedures for protecting Texas waters from feedlot wastes. Factors that affected the feedlot wastes and the quantity and quality of such wastes were discussed. Waste disposal methods and designs for feedlot pollution abatement systems were examined. (See W76-12364 thru W76-12368) (Kehl-East Central)
W76-12363

FACTORS AFFECTING QUALITY AND QUANTITY OF FEEDLOT WASTE COLLECTIONS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5D.
W76-12364

SOIL CONSERVATION SERVICE STANDARD AND SPECIFICATIONS FOR POLLUTION ABATEMENT MEASURES FOR CONFINED LIVESTOCK OR POULTRY FEEDING OPERATIONS,
Soil Conservation Service, Temple, Tex.
E. L. Alexander.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 10 p. 1 tab.

Descriptors: *Pollution abatement, *Confinement pens, *Livestock, *Poultry, *Regulation, *Agricultural runoff, Design criteria, Water pollution, Basins, Lagoons, *Farm wastes, Waste disposal, *Water quality standards, Waste treatment.
Identifiers: Site selection, Pollution control, Holding ponds, Land disposal.

Guidance and criteria applicable to practices and facilities for the diversion of uncontaminated offsite drainage and for the interception, settling, collecting and disposing of contaminated runoff from livestock or poultry feeding areas are presented. Criteria for the selection of a site and for the design of the feeding operation are given. (See also W76-12363) (Kehl-East Central)
W76-12367

GUIDELINES FOR HANDLING LIQUID WASTE FROM FEEDLOTS,
Texas Water Quality Board, Austin.
D. L. Pittman.
In: Soil Conservation Service, Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 4 p.

Descriptors: *Feed lots, *Liquid wastes, *Agricultural runoff, *Waste water disposal, *Water quality standards, Waste treatment, *Farm wastes.
Identifiers: *Solid waste disposal, Waste Control Order for Cattle Feeding Operations, Holding ponds.

The procedure for obtaining a Waste Control Order for Cattle Feeding Operations from the Texas Water Quality Board is given. Application evaluation is primarily based on pollution control measures for the following: (1) collection and retention of feeding area runoff water, (2) disposal of accumulated waste water, (3) groundwater protection from holding pond waste water seepage, and (4) disposal of accumulated solid waste. The process of obtaining a waste control order generally takes 3 months or longer. (See also W76-12363) (Kehl-East Central)
W76-12368

OUTLOOKS FOR THE FUTURE OF DEEP WELL DISPOSAL,
SCS Engineers, Reston, Va.
For primary bibliographic entry see Field 5E.
W76-12370

BASIC REMOTE SENSING INVESTIGATIONS FOR BEACH RECONNAISSANCE: AN INTERIM REPORT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W76-12375

PREDICTED OIL SLICK MOVEMENT FROM VARIOUS LOCATIONS OFF THE NEW JERSEY-DELAWARE COASTLINE,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 5B.
W76-12376

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS (164.6) STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, Md.
For primary bibliographic entry see Field 5A.
W76-12377

AN IN-SITU INVESTIGATION OF OIL BARRIER SHAPE AND DRAG COEFFICIENTS,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
R. M. Larrabee, and G. A. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 099, $7.25 in paper copy, $3.00 in microfiche. U.S. Coast Guard Final Report No. USCG-D-161-75, July 1974. 201 p, 80 fig, 21 tab, 28 ref, 5 append. DOT-CG-33,962-A.

Descriptors: *Continental Shelf, *Oil pollution, *Oil spills, Resources development, *Water quality control, *Pollution abatement, *Barriers, Drag, Ocean currents, Waves(Water), *Rhode Island, Bays.
Identifiers: Outer Continental Shelf, Offshore technology, Wave action, Current action, *Oil barriers, *Narragansett Bay(RI).

In-situ experimentation on a moored 100 foot section of commercially procured oil barrier was carred out in the vicinity of the Jamestown Bridge in the West Passage of Narragansett Bay. The objectives were to study oil barrier shape and tensions as influenced by current and wave action, to analyze data on the barrier shape with existing analyses and to compare results of tension and drag coefficient data with previous investigations. Actual barrier shape was compared to a theoretical catenary drawn through the barrier end points. The shape, load, current and wave data were used to calculate various drag coefficients for the boom. Two techniques were used to calculate drag coefficients for the barrier and results of each were compared. The effects of wave action on barrier loading were determined by the analysis of two previous investigators and the results compared. Values of drag coefficient were reduced to a basic drag coefficient, independent of barrier shape configuration as well as wave effects. Results of the investigation showed that the catenary curve is a good approximation to barrier shape. The values of drag coefficients calculated indicate that a value of 1.5 to be a good approximation for the calm-water basic drag coefficient for the moored oil barrier. (Sinha-OEIS)
W76-12378

COMPARISON OF ECOLOGICAL IMPACTS OF POSTULATED OIL SPILLS AT SELECTED ALASKAN LOCATIONS. VOLUME I. INTRODUCTION, SUMMARY, METHODOLOGY, EVALUATION AND APPENDICES,
Mathematical Sciences Northwest, Inc. Bellevue, Wash.
For primary bibliographic entry see Field 5C.
W76-12379

HIGH SEAS OIL CONTAINMENT BARRIER MOORING SYSTEM,
Coast Guard Research and Development Center, Groton, Conn.
K. R. Bitting.
Available from the National Technical Information Service, Springfield VA 22161 as ADA 020 980, $5.00 in paper copy, $3.00 in microfiche. Final Report No. USCG-D-176-75, July 1975. 86 p, 14 fig, 3 tab, 4 append.

Descriptors: *Continental Shelf, *Oil pollution, *Oil spills, *Pollution abatement, Water quality control, *Barriers, Water resources, Resources development.
Identifiers: *Outer Continental Shelf, *Mooring systems, *Oil containment.

The mooring system was designed, fabricated and tested to moor the Air Deployable Lightweight High Seas Oil Containment Barrier, a component of the U. S. Coast Guard's High Seas Oil Spill Response System. The key criteria to which the mooring system was buit are: (1) deliverable by HH-3 helicopter, (2) holding capacity of 8,500 pounds with 1,000 pound nominal load, (3) capability of obtaining a mooring scope of 2:1 to 3:1 in water depths of 25 to 200 feet. The system consists of an inflatably buoy, 500-pound STATO anchor, 550 feet of 7/8 diameter polyurethane-jacketed nylon line and 45 feet of 3/4 inch chain, and a delivery container. Once the mooring system has been delivered to the site by the helicopter, a small boat tows it to the location and activates the system. The delivery container is recovered by a buoy tender once the system has been deployed. Computer methods were used to size the anchor and mooring line segments that are used to construct a mooring of desired length and scope. Anchor holding power and operational sequence tests were conducted. The system weighs 2,350 pounds and has a delivery radius of 70 nautical miles as external cargo under an HH-3 helicopter. (Sinha-OEIS)
W76-12384

FAST CURRENT OIL RESPONSE SYSTEMS, TESTS ON PHASE I CONCEPTS,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
W. P. Graebel, and V. A. Phelps.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA 022 928, $9.75 in paper copy, $3.00 in microfiche. U. S. Coast Guard Final Report No. USCG-D-20-76, April 1975. 305 p, 219 fig, 7 tab, 5 append. DOT-CG-32430-A.

Descriptors: *Instrumentation, *Oil pollution, Water quality control, *Separation techniques, *Pollution abatement, *Data processing, Testing, Test facilities, *Water pollution control, Equipment.
Identifiers: Fast current oil response systems, *Oil recovery.

Seven different concepts for fast current oil response systems were tested at the University of Michigan Fast Current Recirculating Channel. The purpose of the tests was to perform an equivalent series of tests on each device under the same environment to enable competitive comparison of the devices. This evaluation was made both quantitatively through instrumentation, and qualitatively by observation of the tests. Testing was done by University of Michigan staff with a U. S. Coast Guard officer in attendance. The device was operated by the contractor. The test program matrix included three oil viscosities, four nominal slick thicknesses, and seven current speeds. A maximum of fifty-one tests were scheduled for each device, depending on device size and capacity. The seven concepts are ranked in the order of best performance. None of the seven devices tested are near to meeting the stated goals of the Coast Guard, although they do improve present current speed capabilities by a factor of three when compared to barriers. (Sinha-OEIS)
W76-12385

EVALUATION OF MEMBRANE OIL POLLUTION PREVENTION SYSTEM RESEARCH,
Daedalean Associates, Inc., Woodbine, Md. Springlake Research Center.
A. A. Hochrein Jr., J. D. Helm, and A. P. Thiruvengadam.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A018 945, $4.50 in paper copy, $3.00 in microfiche. U. S. Coast Guard Final Report No. USCG-D-175-75, August 1975. 67 p, 10 fig, 1 tab, 23 ref. DOT-CG-52,312-A.

Descriptors: *Oil pollution, Water resources, Water quality control, Pollution abatement, Oily water, *Membranes, Coasts, Transportation, Elastomers, Continental Shelf, Water pollution control, Waste water treatment.
Identifiers: Ballast tanks.

The research and engineering development effort on the membrane oil pollution prevention system (MOPPS) conducted for U. S. Coast Guard and U. S. Navy is reviewed and evaluated. Scale model tanks were used to define and evaluate problems associated with dynamic response of membrane configurations under simulated operating conditions. A commercially available neoprene-nylon-nitrile elastomer was found to be the best material for the membrane. Evaluation of the physical properties of a full scale thickness material indicates that the elastomer can withstand abrasion, oil immersion, creasing, wrinkling and pressure fluctuations. Preliminary results indicate little susceptibility to biodeterioration. However it is believed that further study on MOPPS is not warranted at the present time because of costs, operational complexity, and apparent industry acceptance of segregated clean ballast systems. (Sinha-OEIS)
W76-12388

ANALYSIS OF THE ROLE OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas Engineering Experiment Station, College Station.
P. J. Shepard.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 373, $8.00 in paper copy, $3.00 in microfiche. Sea Grant Report No. TAMU-SG-75-202, December 1974. 246 p, numerous fig and tab, separate ref for each report. 04-3-158-18.

Descriptors: *Resources development, *Texas, Water resources, *Environmental effects, *Ecosystems, Water quality control, Dredging, Waste disposal, Coasts, Transportation, Engineering, Economics, Social impact, Legal aspects, Gulf of Mexico.
Identifiers: *Gulf Intracoastal Waterway(Tex).

Six tasks on various facets of the Gulf Intracoastal Waterway in Texas are reported. The reports describe the role of the Gulf Intracoastal Waterway as a transportation artery and the significance of this system to the economy of Texas. The task report provide baseline data on the Waterway on environmental implications, engineering aspects, sociological characteristics, economic impacts, funding alternatives, and legal considerations. A major thrust is an analysis of State sponsorship for maintenance and development of the Waterway. Funding alternatives are described for State sponsorship including estimated amortization and total costs for varying administrative and fiscal scenarios. Supplementing the approach is a thorough analysis of historical and existing laws bearing on State sponsorship. A dominant theme of the effort was to document the importance of the Waterway to the people and economy of Texas. This report includes findings and alternatives expressed by various researchers. (See also W76-12390) (Sinha - OEIS)
W76-12389

ENVIRONMENTAL IMPLICATIONS OF MAINTENANCE AND IMPROVEMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
R. B. Ditton, and R. L. Schmied.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 373, $8.00 in paper copy, $3.00 in microfiche. In: Texas A and M University Sea Grant Report No. TAMU-SG-75-202, p 11-52, December 1974. 6 fig, 3 tab, 21 ref. 04-3-158-18.

Descriptors: Water resources, *Texas, *Dredging, *Environmental effects, *Water quality control, *Ecosystems, Ecology, Fisheries, Nutrient, Biota, Grasses, Waste disposal, Gulf of Mexico.
Identifiers: Environmental impact, *Gulf Intracoastal Waterway(Tex).

A cursory review is given of some of the environmental considerations and impacts involved in maintenance and development of the Gulf Intracoastal Waterway. While no new primary data sources were generated, a vast amount of published material was reviewed in drafting this statement. Following a conceptual review of the environmental sub-systems contingent with the path of the GIWW, impacts associated with the maintenance and development of the Waterway are discussed and alternative means of materials disposal are analyzed. (See also W76-12389) (Sinha-OEIS)
W76-12390

USE OF THE METHOD OF MATHEMATICAL DESIGN OF EXPERIMENT IN SANITARY-CHEMICAL INVESTIGATIONS OF EPOXY COATINGS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. O. Sheftel', and V. A. Tsendrovskaya.
Gig Sanit. 10, p 66-68, 1974.

Descriptors: *Epoxy resins, *Protective coatings, *Pipes, Water temperature, *Regression analysis, *Water pollution control, Water pollution sources, Toxicity, Lethal limit, Organic compounds.

The effects of the 3 most essential factors on the intensity of migration of polyethylene-polyamine, diphenylol-propane and epichlorohydrin into water from epoxy coatings of water pipes, namely, time of contact of the material with water, temperature of the water and specific surface were studied. Analysis of the regression equations allowed recommendations on the development of nontoxic formulas of epoxy coatings and their use.--Copyright 1975, Biological Abstracts, Inc.
W76-12393

RESPONSE OF WATER-HYACINTH TO LASER RADIATION,
Oral Roberts Univ., Tulsa, Okla. Dept. of Natural Sciences.
For primary bibliographic entry see Field 4A.
W76-12406

COASLESCENCE FILTER FOR OIL-WATER DISPERSIONS,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
C. R. Bresson.
U.S. Patent No. 3,960,719, 3 p, 1 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 306, June 1, 1976.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution treatment, *Water quality control, Filtration, *Coalescence, Polymers, *Separation techniques, *Dispersion, *Filters.
Identifiers: Ballast water.

A filtering media is provided for the removal of oil dispersed in a water phase such as ballast water in water tankers and bilge water from oil fired ships. A fabric made of an oleophilic, fiber-forming polymer having a high ratio of surface area to unit weight is used as the filtering medium through which is passed a mixture of oil droplets dispersed in a water phase thereby agglomerating the oil into sufficiently large drops that they will separate from the water phase to form a separate oil phase. Although a nonwoven fabric comprising a needled bat of carded fibers forms a basis for the experimental data, any method of producing a coherent fabric, such as weaving, should be suitable for the invention as long as the fabric produced has a high ratio of surface area to unit weight. The fabric will be used in multiple thicknesses in constructing a filter element. In a preferred embodiment a nonwoven fabric comprising a needled bat of carded polypropylene fibers fused on one side only and capcoated with an additional layer of polypropylene fibers needle punched into the unfused side was tested as a coalescing agent suitable for the invention. (Sinha-OEIS)
W76-12408

OIL ADSORBENT,
Idemitsu Kosan Kabushiki Kaisha (Japan). (Assignee).
M. Tomikawa, A. Tsunoda, K. Kaneda, H. Ohkawa, and Y. Mugino.
U.S. Patent No. 3,960,722, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 307, June 1, 1976.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, *Water quality control, *Adsorption, Industrial wastes, Oil spills, Plastics.

An oil adsorbent is provided which is capable of effectively removing oil in water, has negligible water adsorbability and is easily disposable by incineration. A resin of polyethylene series is heated at a temperature near the softening point of the resin. An inorganic calcium compound is then added to the softened resin and the mixture is homogeneously mixed and the temperature is gradually elevated. The mixing operation is finished when the temperature of the mixture has reached 130-170C. The resultant milled mixture is then cooled, solidified and crushed to a solid granular material which is then charged into a conventional foam shaping extruder where the material is heated to a melt. The melt is extruded to form a foamy substance. The foamy substance in the form of a rope is shaped into a net by knitting or weaving or by adhesion. When the network product thus shaped is used as oil adsorbent, oils are not only adsorbed to the product but also kept in the interstices. (Sinha-OEIS)
W76-12409

REMOTE SENSING OF MARINE HYDROCARBON SEEPS,
Barringer Research Ltd., Rexdale (Ontario). (Assignee).
For primary bibliographic entry see Field 5A.
W76-12411

THE EFFECT OF METHODS OF OPERATION OF AERATION BASINS ON THE DEVELOPMENT AND POPULATION DENSITY OF CULEX PIPIENS L. IN THE SOUTH OF THE RUSSIAN SFSR, (IN RUSSIAN),
Rostov Research Inst. of Medical Parasitology (USSR).
L. Y. Il'chenko.
Med Parazitol Parazit Bolezn. 43(3), p 335-341, 1974.

Descriptors: Aeration, *Sewage lagoons, *Oxidation lagoons, *Mosquitoes, Insect control, *Aerated lagoons, *Insect control, Operations, Sewage treatment.
Identifiers: *Culex-pipiens, Russian-SFSR, USSR.

In the suburbs of Novocherkassk (USSR), sewage treatment basins are mass breeding places of C. pipiens. Improper operation leads to overloading with sewage and creates favorable conditions for mass breeding of these mosquitoes. Development of the water stages of C. pipiens depended mainly on the operating regimen of these aeration basins. Certain regimens completely prevent emergence of mosquitoes and permit control of C. pipiens by sanitary-hydrotechnical measures without insecticides.--Copyright 1975, Biological Abstracts, Inc.
W76-12419

COST OF WATER POLLUTION CONTROL IN THE CARPET INDUSTRY,
Exxon Research and Engineering Co., Florham Park, N.J. Water Pollution Control Section.
B. Black, L. D. James, and E. C. Tincher.
American Dyestuff Reporter, Vol 65, No 6, p 16, 18-19, 22, 61-62, June, 1976. 5 tab, 13 ref.

Descriptors: *Textiles, *Water pollution control, *Economic impact, *Legal aspects, Legislation, Costs, Federal Water Pollution Control Act, Industrial wastes, Waste water treatment, *Water quality standards.
Identifiers: Textile industry, Carpet and rug industry.

The economic impact of effluent guidelines required by the Federal Water Pollution Control Act of 1972 on the carpet and rug industry is examined. Under the Act, carpet mills that discharge pollutants directly to the environment must install the best practicable control technology currently available by 1977 and the best technology economically achievable by 1983. The typical investment for water pollution control equipment by 1983 is expected to be between $500,000 and $1 million for a mill. The cost of producing a square yard of carpet may increase by about 2.4 cents by 1977 and by 5 cents by 1983. These increases seem too small to affect sales on the basis of available data. (Kreager-FIRL)
W76-12422

GROUND-WATER AND SURFACE-WATER RELATIONSHIPS IN THE GLACIAL PROVINCE OF NORTHERN WISCONSIN - SNAKE LAKE,
Adolph Coors Co., Golden, Colo.
N. G. Jaquet.
Ground Water, Vol. 14, No. 4, p 194-199, July-August 1976. 7 fig, 7 ref.

Descriptors: *Surface-groundwater relationships, *Wisconsin, Central U.S., *Glacial aquifers, *Subsurface flow, * Lakes, *Tracking techniques, *Eutrophication, Groundwater, Groundwater movement, Percolation, Sediments, Seepage, Lake beds, Seasonal, Limnology, Flow system, Lake stages, Unsteady flow.
Identifiers: *Lake flushing rates, *Lake rejuvenation, Northern Wisconsin, *Snake Lake(Wis), Seasonal water level fluctuations, Tracer studies.

Lake rejuvenation efforts in the Upper Midwest are important to the area's economic dependence on high-quality lakes for tourism. In developing eutrophication studies for lakes in this area, it is essential to determine the thickness of aquifer communicating with the lake, as a preliminary to calculation of the lake flushing rate. The thickness of communicating aquifer is particularly critical for lakes fed primarily by ground-water recharge, e.g., Snake Lake, Wisconsin. Through use of observation wells and chloride tracer analysis, effective aquifer thickness at Snake Lake was determined to be 30 to 50 feet. However, the local flow systems were additionally found to be highly variable through the progression of seasions. It was recommended that the possible effect of such dynamic seasonal fluctuations on the local flow

system be considered in eutrophication studies to avoid possible improper siting of underground chemical and/or petroleum storage facilities and septic tanks in glacial deposit environments. (Prickett-ISWS)
W76-12444

WATER POLLUTION CONTROL IN THE SCANDINAVIAN COUNTRIES,
National Water Board of Finland, Helsinki.
For primary bibliographic entry see Field 5D.
W76-12473

POLLUTION CONTROLS -- CONSULTANT'S ROLE,
Mason (H. C.) and Associates, Inc., Gladstone, Oreg.
H. Edel.
In: Proceedings on Wood Residue as an Energy Source, September 3-5, 1975, Denver, Colorado, Forest Products Research Society, Madison, Wisconsin, p 114-115.

Descriptors: *Pollution abatement, Water pollution control, Air pollution, Solid wastes, Legislation, Profit, Economic impact, Safety, Wastes, Industrial wastes, Water pollution sources.
Identifiers: *Forest products industry, Noise pollution.

An increasing number of pollution control problems, such as boiler emissions, water pollution, solid wastes, noise levels, etc., from forest industry production facilities are being dealt with by consulting firms. All of these control problems have had major consequences to the forest products industry since the enactment of many federal, state, and regional pollution and safety regulations. Economic consequences of meeting strict pollution regulations were given little thought initially by legislators. The pollution control problems that require help from a consultant, however, are usually the more subtle aspects for meeting the detailed requirements of particular regulations. The primary role of a consultant is to increase productivity and profits while meeting established pollution regulations. (Witt-IPC)
W76-12478

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
W. D. Haseman, C. Holsapple, and A. B. Whinston.
Reprint No. 601. Reprint series of the Institute for Research in the Behavioral, Economic, and Management Sciences, Krannert Graduate School of Industrial Administration, Purdue University, West Lafayette, Indiana. 7 p, 4 fig, 17 ref.

Descriptors: *Water quality, *Management, *Data storage and retrieval, *Data collections, *Water pollution control, Planning, Computers, Computer programs, Behavior, Networks, Monitoring, Systems analysis.
Identifiers: *Data bases, Query language.

The development of a computer-based information system for a state Stream Pollution Control Board is examined. It is concerned with the application of the Generalized Planning System (GPLAN) to a large scale water pollution problem. This planning system, which includes both a database and a collection of application programs, has been passing through a series of modifications and extensions to make it more adaptive to its environment. Although much theoretical work has gone into the GPLAN system design, the key to its acceptance will indeed be determined by those changes, as discussed in this paper, which have been a direct result of actual implementation and use in a real life situation. (Bell-Cornell)
W76-12521

POLLUTIONAL ANALYSIS OF COMBINED SEWER SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W76-12530

WATER QUALITY LAW IN FEDERAL REPUBLIC OF GERMANY,
Bonn Univ. (West Germany). Inst. fuer das Recht der Wasserwirtschft.
K. Seifert, and T. C. Lyons.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR1, p 23-33, April 1976. 1 fig, 1 tab, 10 ref.

Descriptors: Water resources, *Water law, *Water quality, *Legislation, Water pollution, Europe, *Water pollution control, Water rights, History.
Identifiers: *West Germany.

The Federal Republic of Germany (FRG) is one of the most industrialized countries in the world today with a Gross National Product exceeded only by two other nations (USA and Japan). This industrial base, as well as a population of 62,000,000, is crowded into an area of 248,000 sq km, which is about the size of the State of Oregon. Attendant with this intensive development have been the same water quality problems that plague all heavily industrialized nations. Like other countries with these environmental problems, the FRG has developed a body of laws and administrative procedures that are intended to expedite the nation's effort in environmental enhancement. This paper traces the historical development of legislation and administrative procedures in water quality law and their practicability. The paper concludes with proposals on both changes in the laws and in the methods with which water quality legislation could be implemented and administered in the FRG. (Bell-Cornell)
W76-12531

A STUDY OF RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL ENGINEERING USING SYSTEM APPROACH,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6B.
W76-12533

TECHNIQUES OF SIMULATION FOR HYDROLOGIC COMPUTATION, IN QUANTITY AND QUALITY, OF INTEGRATED WATER RESOURCES DEVELOPMENTS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Dept. of Fundamental Research Bureau.
For primary bibliographic entry see Field 6A.
W76-12539

APPLICATION OF MATHEMATICAL MODELLING TO WATER QUALITY FORMATION PROCESSES FOR OPERATIVE MANAGEMENT OF COMPLEX WATER RESOURCES SYSTEMS,
Vsesoyuznyi Nauchno-Issledovtelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
V. R. Lozansky, E. V. Eremenko, and V. P. Belogurov.
The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Vol. II, p 49-52. 7 ref.

Descriptors: *Water quality, *Mathematical models, *Management, *Operations research, Water resources, Computers, Hydrodynamics, Equations, Rivers.
Identifiers: *Formation processes.

At present, water quality formation processes may be mathematically modeled in various ways. The choice of model depends on the volume of the required information, as well as upon the volume of the available initial information and on the required precision of the information obtained. Employment of any modern mathematical model demands the application of computers and their limitations and may also influence the choice of an applicable model. Herein, a river with a system of water-protecting construction is investigated; considerable involvement and space distribution are the usual characteristics, as well as a large number of natural and man-made factors influencing the processes of the river water quality formation, a multitude of uncontrollable disturbances, the limited possibilities of operative effects, and a large number of interacting regulators. Considered are two principally different approaches to model construction: the analytical and the synthetic. For operative control in complex systems of water resources it is possible to apply mathematical models constructed on the basis of both methods. A model for each specific case should be chosen according to the peculiarities of the subject, the required information, and the computer capacity. (See also W76-12535) (Bell-Cornell)
W76-12547

EXPERIENCES WITH MATHEMATICAL MODELS USED FOR WATER QUALITY AND QUANTITY PROBLEMS,
Rijkswaterstaat, The Hague(Netherlands), Data Processing Div.
For primary bibliographic entry see Field 6A.
W76-12548

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY'S STORM WATER MANAGEMENT MODEL,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
H. G. Torno.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April, 1974, Vol. II, p 88-91.

Descriptors: *Environmental engineering, *Water pollution control, *Storm water, *Management, *Mathematical models, Urban runoff, Simulation analysis, Computers, Systems analysis.
Identifiers: *Storm Water Management Model.

Recent investigations have revealed that storm water discharges and combined sewer overflows are major sources of urban water pollution. It is obvious that construction of separate storm and sanitary sewers is not the solution, and it is equally infeasible to construct treatment plants capable of treating the peak flows generated in a combined system. The development of the digital computer has made complex mathematical models widely available to the engineer, and such an approach is ideally suited to the examination of storm and combined sewer overflow pollution abatement alternatives. The EPA's Storm Water Management Model (SWMM) is a comprehensive model of urban hydrological phenomena. It uses the rainfall and system characteristics as inputs, determines quantity and quality of runoff, routes this runoff through a combined sewer system with specified storage and treatment facilities and operating policies and thence into receiving waters, where their impacts are identified. This article describes the model, lists its applications, and discusses needed modifications for its future development and application to assist in the design of pollution control facilities. (See also W76-12535) (Bell-Cornell)
W76-12549

THE APPLICATION OF MATHEMATICAL MODELS AND OPTIMIZATION TECHNIQUES IN PLANNING WATER SUPPLY AND WASTE WATER DISPOSAL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 6A.
W76-12560

ELABORATION AND USE OF A MATHEMATICAL MODEL TO FORECAST IN QUANTITY AND QUALITY, THE WATER DEMANDS OF VARIOUS SECTORS OF INDUSTRY,
Societe du Canal de Provence et d'Amenagement de la Region Provencale Le Tholonet, Aix-en-Provence (France).
For primary bibliographic entry see Field 6D.
W76-12562

BENEFIT COST ANALYSIS--A NECESSARY PART OF ENVIRONMENTAL DECISIONING,
Minnesota Univ., Duluth. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W76-12576

ANOTHER VIEW OF OFFSHORE OIL AND GAS OPERATIONS.
Marine Technology Society Journal Vol 8, No 9, p 2-12, October/November 1974. 34 ref.

Descriptors: *Environmental effects, *Resources development, *Water quality control, Water resources, Continental Shelf, Oil, Gases, Assessment, Leases, Ecology, Drilling.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Environmental impact, *Offshore drilling.

The report 'OCS Oil and Gas - an Environmental Assessment,' was examined by a committee of the National Academy of Sciences. Excerpts from the committee's findings about the CEQ report and the issues, both technical and of public policy are presented. While the Council on Environmental Quality (CEQ) Report is a responsive advisory statement on future environmental policies regarding OCS oil and gas, the committee wishes to stress the study's limited mandate as well as its understandable avoidance of consideration of alternatives to our current national energy policy. The report accepts OCS development as an exclusive activity of the private sector without examining various legislative proposals for a federal oil development corporation or for other public development entities such as exist in other countries that produce oil and gas. Finally, the report relies on the precept that continued annual growth in energy availability to the year 2000 and beyond is accepted public policy. The committee believes that these assumptions should be challenged by all concerned with the development of a viable, long-term national energy policy. The committee recommends that a vigorous effort be initiated to expand knowledge of the physical and biological environments and the ecological systems likely to be affected. Ecological studies of an area that might be affected by OCS development should be conducted while plans are developing for exploration and engineering, so that the possible effects can be evaluated before significant impacts occur. (Sinha - OEIS)
W76-12577

ONE APPROACH TO THE SUPERPORT/REFINERY QUESTION,
Texas Coastal and Marine Council, Galveston.
J. C. Moseley, and J. Frucht.
Marine Technology Society Journal, Vol 8, No 8, p 3-9, September 1974.

Descriptors: *Continental Shelf, *Resources development, *Oil industry, Water resources, *Oil pollution, *Water quality control, *Environments, Effects, Management, Planning, Ports, Coasts, New England, New Hampshire.
Identifiers: *Outer Continental Shelf, *Superports, Refineries, Deepwater ports, Environmental impact.

A brief discussion is presented on the controversial issues on the construction of deepwater ports (superports) and the required oil refineries. It was presented before a New England conference on the subject held at the University of New Hampshire. The authors make the following suggestions: Realize that a large deepwater port and/or refinery complex is a permanent irreversible commitment; Learn something about the oil business--something other than Exxon ads and Common Cause press releases; Realize the difference between evolutionary and revolutionary actions/impacts in the context of DWPs and refineries; Realize that even in Texas, the oil and chemical industry doesn't own all politicians; Realize that credibility is usually proportional to size; Realize the magniture of the stakes involved; Consider a DWP/refinery and Outer Continental Shelf oil and gas development as related issues; Do not believe the promises and/or threats of promoters and hysteria peddlers; Do not act hastily nor finally with either closed or open arms; Do not naively believe that things can be completely controlled once development starts, and Do not become confused by lawyers (or engineers, or planners, or ecologists, or etc.) debating the finer points of facility siting/regulatory legislation and lose sight of the major public policy issues. On the issue of deepwater ports and refineries the private citizen's responsibilities include: seeing that all the appropriate issues are raised and revealing questions asked, pressing elected/appointed officials to thoroughly pursue the matter, and insisting on full and accurate disclosure by all included parties. (Sinha - OEIS)
W76-12578

DEVELOPMENT OF RESIDUALS MANAGEMENT STRATEGIES,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
C. N. Ehler, R. S. Howe, and N. White.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 012, $5.00 in paper copy, $3.00 in microfiche. Environmental Protection Agency, Report EPA-600/1-76-01/B, January 1976. 82 p, 6 fig, 5 tab, 3 append. R-803313-01-1.

Descriptors: *Waste disposal, *Decision making, *Planning, *Non-structural alternatives, *Water management(Applied), Pollution abatement, Water quality, Alternative planning, Institutions, Environment.
Identifiers: *Residuals, Residuals generation and discharge model, Residuals management strategies, Implementation, Physical methods.

Based on the premise that human activity generates and discharges waste residuals, a residuals generation and discharge model is proposed to achieve governmental standards of environmental quality. The residuals management model identifies various points in the residuals generation and discharge process where intervention with physical methods can reduce or alleviate the effect of residual wastes on the environment The physical methods are supplemented by implementation measures (non-structural actions such as laws, regulations and ordinances) and institutional arrangements (public organizations which establish goals and objectives, select and enforce physical methods, and adopt implementation measures) to form a residuals management strategy. Recommendations are: (1) use residuals generation and discharge model in the planning process; (2) the planning process for reviewing alternative residuals management strategies should start without considering legal, political, technological or social constraints; (3) all reasonable alternatives should be considered by decision makers; (4) the residuals generation and discharge model could serve as a common base for consumers, labor, business and government groups concerned with planning for environmental quality. (Gentry-North Carolina)
W76-12581

A METHODOLOGY TO MEASURE THE PERFORMANCE OF THE EPA REGIONAL EIS REVIEW PROCESS,
Argonne National Lab., Ill. Energy and Environmental Studies Div.
For primary bibliographic entry see Field 6G.
W76-12583

REPORT OF THE QU'APPELLE BASIN STUDY BOARD.
Saskatchewan Quappelle Basin Study Board, Regina.
October 1972. 92 p, 50 fig, 17 tab, 3 plates, 34 ref.

Descriptors: *Water quality, Water management, *Land use, Water resources, *Watershed protection, *Water supply, *Flood protection, *Canada, Algae, Planning, Agriculture, Institutions, Waste water treatment, Water use, River basins, *Saskatchewan.
Identifiers: *Qu'Appelle River Basin, Moose Jaw(Saskatchewan), Regina(Saskatchewan), Buffalo Pound Lake(Saskatchewan).

A comprehensive framework plan to develop and manage the water and related land resource of the Qu'Appelle Basin for social betterment and economic growth is presented. It was prepared by collecting basic data, determining planning objectives, analysing and evaluating alternatives, and finally, preparing the plan. The basin, which is a flat or gently undulating treeless plain, contains 20,000 square miles and is cut by the Qu'Appelle River Valley through its entire length to a depth of 100 to 300 feet. Population, currently at 280,000, will reach 320,000 by the year 2000. Continued urbanization in the basin is expected. Problems include algae blooms, flooding in urban areas, poor public access to lake shores in places, and possible water supple difficulities in the future. The plan contributes to a number of objectives: water supply and quality; industrial development public health; flood protection; recreation; wildlife; etc. Recommendations are presented in 5 categories; water quality; water supply; land and water surface use; adjustment to flood hazard; and general. Some recommendations for water quality are: specific objectives for water quality should be established; higher levels of treatment should be provided in Regina and Moose Jaw; agricultural practices in the basin should be controlled; regulations for waste disposal should be implemented; and water quality should be monitored. Recommendations with similar scope are given in the other areas. Recommendations on public participation, institutions, education, construction standards, and ownership are discussed in the general category. (Smith - North Carolina)
W76-12587

WATER QUALITY OBJECTIVES.
Environmental Protection Service, Regina (Saskatchewan). Water Pollution Control Branch.
January 1975. 16 p, 6 tab, append.

Descriptors: *Water quality, *Water quality standards, *Pollution, Water resources, *Water management, *Saskatchewan, Surface waters, Groundwater, Algae, Municipal water, Sewage treatment.
Identifiers: *Water quality objectives, Private water supply.

This listing of specific objectives pertains mainly to surface water, but deals to a small degree with ground water resources. The management objective of this agency is to conserve and protect water resource and to maintain and improve its quality for public protection, within economic limits. This serves the following purposes: protection of water supplies; encouragement of economic development; preservation of wildlife. The guidelines and objectives ennumerated here are not meant to be rigid, but serve as guides. Each case of waste disposal and water pollution is looked at on its own merits while considering a broader water quality

management point of view. The general objectives for effluent discharges are that such discharges should be: free from toxic or potential toxic substances; free from substances that will form objectionable sludge; free from debris, oil, etc. that would be noticeable in receiving waters; free from color, turbidity, or odour-producing materials that would have certain effects; and free from nutrient that would create nuisance growths. Specific objectives are given for: surface water, algae and acquatic nuisances, municipal drinking water, ground water quality, guidelines for private water supplies, and guidelines for sewage treatment. Objectives are given both as numbers and more general statements. An appendix explains 43 separate parameters used to measure water quality. (Smith - North Carolina)
W76-12588

USE OF EMERGENCE DATA FOR ESTIMATING ANNUAL PRODUCTION OF AQUATIC INSECTS,
Oregon State Univ., Corvallis. Dept. of Entomology.
For primary bibliographic entry see Field 2I.
W76-12597

A SURVEY OF PHOSPHORUS REMOVAL IN WISCONSIN,
Howard, Needles, Tammen and Bergendoff, Milwaukee, Wis.
For primary bibliographic entry see Field 5D.
W76-12649

U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND ENVIRONMENTAL POLLUTION ABATEMENT PROGRAM,
For primary bibliographic entry see Field 5D.
W76-12651

WASTEWATER RESOURCES IN NORTH CENTRAL TEXAS,
Camp, Dresser and McKee, Inc., Boston, Mass.
D. R. Horsefield, and J. D. Goff.
American Water Works Association Journal, Vol. 68, No. 7, p 357-359, July, 1976.

Descriptors: *Water reuse, *Reclamation, *Reclaimed water, *Municipal wastes, *Cooling water, *Electric power industry, Treatment facilities, Water requirements, *Texas, Symbiosis.

The feasibility and desirability of waste water reclamation in North Central Texas are discussed. A review of various water reuse alternatives for the area indicates that the steam electric power industry is a potentially large user of reclaimed waste water. Cooling water requirements for the 11 major power plants in North Central Texas amount to an estimated 56 million gallons/day based on the present utilization of cooling towers and lakes, and water requirements are expected to more than double within the next 10 years. By the year 2000, water requirements based on existing cooling technology are expected to be a major problem for the power industry. Thus, the locating of new power plants near municipal waste water facilities so that high quality effluent can be used for cooling towers is recommended. (Kreager-FIRL)
W76-12652

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMIZATION OF REAL TIME DAILY OPERATION OF A MULTIPLE RESERVOIR SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W76-12155

PLANNING THE LOCATION AND CAPACITY OF FLOOD CONTROL STRUCTURES,
Cornell Univ., Ithaca, N. Y. Coll. of Engineering.
For primary bibliographic entry see Field 4A.
W76-12156

WABASH RIVER SYSTEMS MODEL - TERMINAL REPORT PHASE I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12220

AVAILABILITY OF GROUND WATER NEAR CARMEL, HAMILTON AND MARION COUNTIES, INDIANA,
Geological Survey, Indianapolis, Ind.
D. C. Gillies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 224, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-46, May 1976. 27 p, 10 fig, 2 tab, 7 ref.

Descriptors: *Groundwater resources, *Projections, *Water supply, *Aquifer characteristics, *Hydrogeology, Data collections, Test wells, Water yield, Regression analysis, Computer models, Transmissivity, Storage coefficient, Groundwater recharge, Pumping, Seepage, Water levels, Observation wells, *Indiana.
Identifiers: Carmel area(Ind).

A study of the hydraulic characteristics of the unconsolidated glacial deposits near the city of Carmel in central Indiana shows that 21.3 million gallons per day (mgd) of additional water could be withdrawn from the aquifer for an indefinite period of time. This pumpage is approximately 5 mgd above the projected water needs of Carmel for 1990. Saturated thickness, transmissivity, and storage coefficient of the outwash aquifer along the White River east of Carmel were determined, using available data supplemented by test drilling. The saturated thickness of the aquifer ranges from 10 to 110 feet; transmissivity ranges from 1,000 to 24,000 feet squared per day; and the average storage coefficient is 0.11. Seepage from the aquifer into the White River was estimated in November 1974, using data from U.S. Geological Survey gaging stations. Water-level information was obtained from a network of observation wells at that same time. A digital-computer model was used to estimate the rate of withdrawal that might be sustained from the aquifer and the effect of that withdrawal. The predicted average reduction of the flow of the White River is 21.3 mgd in the study area. To develop the fullest potential of the aquifer and to maintain reasonable pumping rates, pumping wells should be located as near to the river as possible and where the aquifer saturated thickness equals or exceeds 50 feet. (Woodard-USGS)
W76-12287

ECONOMIC UNCERTAINTIES IN WATER RESOURCES PROJECT DESIGN,
Eotovs Lorand Univ., Budapest(Hungary).
F. Szidarovszky, I. Bogardi, L. Duckstein, and D. Davis.
Water Resources Research, Vol. 12, No. 4, p 573-580, August 1976. 3 fig, 4 tab, 21 ref, 1 append.

Descriptors: *Water resources, *Projects, *Design, *Economics, Decision making, Equations, Simulation analysis, Monte Carlo methods, Methodology, Systems analysis, Hydrologic aspects, Flood protection, Levees, Construction costs, Benefits, Height, Optimization, Mathematical models, *Risks.
Identifiers: *Economic uncertainty programming, Benefit maximization, Flood losses, Sensitivity, Error correlation.

Economic uncertainty programing (Ecup) is a method which enables decision makers to analyze economic uncertainties separately from hydrologic uncertanities in the design of water resources systems. Ecup distinguishes between economic and hydrologic variables in the expression of a payoff or objective function. The economic variables, assumed to have been estimated at discrete points only, are treated as random variables. A postulated joint probability distribution of these variables is used to estimate by Monte Carlo simulation the distribution of payoff resulting from a project. The worth of perfect information or expected opportunity loss is calculated. In a case study, the problem of choosing among flood protection levees of different heights is examined. The random economic factors considered are the flood losses and construction costs. The sensitivity to various degrees of error correlation and loss uncertainty is analyzed. It is found that a relatively small uncertainty in the economic estimates of the payoff function may cause considerable variance in both the distribution of benefits to be expected from a levee and the height of the optimal levee. (Bell-Cornell)
W76-12514

INTERDISCIPLINARY MODELS OF WATER SYSTEMS,
Central and Southern Florida Flood Control District, West Palm Beach.
A. N. Shahane.
Ecological Modelling (International Journal on Ecological Modelling and Engineering and Systems Ecology) Vol. 2, No. 2, p 117-145, June 1976. 3 fig, 36 ref.

Descriptors: Water resources, *Ecology, *Mathematical models, Economics, Political aspects, Social aspects, Technology, Environment, Water quality, Methodology, Hydraulics, Hydrology, Optimization, Simulation analysis, Equations, Systems analysis, *Model studies.
Identifiers: *Interdisciplinary models, Water systems, Time series.

To evaluate the complex interactions of various types of water systems, a water resource management agency is invariably involved in the preliminary step of reviewing the available quantitative methods for formulating interdisciplinary aspects of the water systems. With a view to supplement their efforts, an attempt is made herein to review briefly the major useful concepts and models which are intended to broaden the technical horizon of the professionals associated with the regional water resource management programs. Initially, various pathways of model building procedure are outlined. Then associated ecological, economic, social, political, technological and environmental models are discussed in light of some reported quantitative examples. With the understanding of the basic mechanics of these interdisciplinary models, the adequacy of these models and their applications can be examined by the concerned professionals to aid the decision making process for the specific water system in question. (Bell-Cornell)
W76-12516

A DYNAMIC REGIONAL MODEL FOR EVALUATING RESOURCE DEVELOPMENT PROGRAMS,
Manitoba Univ., Winnipeg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4A.
W76-12520

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-12521

WATER SUPPLIES FROM ULSTER VALLEY GRAVELS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 4B.
W76-12524

OPTIMIZATION OF DESIGN CAPACITY OF AN AQUEDUCT,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4A.
W76-12526

BAYESIAN APPROACH TO TILE DRAIN DESIGN,
Ecole Polytechnique Federale de Lausanne (Switzerland). Dept. of Agriculture.
For primary bibliographic entry see Field 8B.
W76-12527

QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL IMPACT,
Parsons (Ralph M.) Co., Pasadena, Calif. Systems Div.
For primary bibliographic entry see Field 6G.
W76-12528

A STUDY OF RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL ENGINEERING USING SYSTEM APPROACH,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6B.
W76-12533

EVALUATING TISZA RIVER BASIN DEVELOPMENT PLANS USING MULTIATTRIBUTE UTILITY THEORY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-12534

THE USE OF COMPUTER TECHNIQUES AND AUTOMATION FOR WATER RESOURCES SYSTEMS.
Economic Commission for Europe (UN), New York. Committee on Water Problems, Economic and Social Council.
Proceedings of a Symposium organized by the Committee on Water Problems of the United Nations Economic Commission for Europe, Washington, D.C., March-April 1974. 186 p, 41 fig, 7 tab, 101 ref.

Descriptors: *Water resources development, Computers, *Automation, *Management, *Methodology, *Planning, *Optimization, *Simulation analysis, Economics, Social aspects, River basins, Reservoirs, Water quality, Water supply, Mathematical models, Systems analysis, Storm water, Hydrology, Waste water treatment, Decision making, Equations.
Identifiers: Cost minimization.

Presented are thirty-three discussion papers dealing with the use of computer techniques and automation to facilitate water resources development planning and management. Many of the articles present case studies to illustrate the application of a proposed methodology, i.e., simulation and/or optimization techniques. Participating countries include the United States, France, Great Britain, West Germany, Russia, the Netherlands, Romania, Finland, and Hungary. The papers are organized under the following three principle topics: (1) general objectives of the use of computer techniques and automation for water resources systems; (2) water quality and quality models for planning; and (3) socio-economic models for planning. The symposium as a whole supports the use of computerized methods to aid in the solution of national and regional complex, comprehensive water planning and management problems. (See W76-12536 thru W76-12567) (Bell-Cornell)
W76-12535

PRESENT SITUATION AND TRENDS IN THE APPLICATION OF ADVANCED METHODS AND TECHNIQUES FOR WATER RESOURCES MANAGEMENT.
Economic Commission for Europe (UN), New York.
For primary bibliographic entry see Field 7C.
W76-12536

PROFESSIONAL REQUIREMENTS OF MODERN WATER ENGINEERS INVOLVED IN RIVER BASIN MANAGEMENT UTILIZING CONTEMPORARY TOOLS,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
For primary bibliographic entry see Field 4A.
W76-12537

OPTIONS OF DEVELOPMENT AND INTEGRATED MANAGEMENT OF WATER RESOURCES,
Ecole Nationale Superieure des Mines de Paris, Fontaine-bleau (France). Center for Geological Information.
For primary bibliographic entry see Field 6B.
W76-12538

TECHNIQUES OF SIMULATION FOR HYDROLOGIC COMPUTATION, IN QUANTITY AND QUALITY, OF INTEGRATED WATER RESOURCES DEVELOPMENTS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Dept. of Fundamental Research Bureau.
M. Roche.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. 1974, Volume II, p 16-19.

Descriptors: *Water resources development, *Simulation analysis, Water quality, Hydrology, Operations, Projects, Hydrologic data, Mathematical models, Time, Hydraulics, Water supply.

In a broad sense, any equipment and organization aimed at satisfying water demands in quantity and quality, satisfying power demands, and protecting man, his environment and his production tools against flood damage and pollution may be considered as a water resources project. When the study concerns a one-structure project, aimed at satisfying only one demand, i is often possible to make estimations with simplified methods, although even in this case using mathematical models may be very useful. For projects involving several structures, various sources of water and multiple uses, it becomes quite impossible to process without using sophisticated methods. Simulation of operating management is then one of the methods which may be used. This article discusses the principle of simulation and describes a water system and its operation. Considered also are the organization of a model for simulation (programme) and input data and their statement. (See also W76-12535) (Bell-Cornell)
W76-12539

USE OF SIMULATION MODELS FOR THE EVALUATION OF A REGIONAL WATER-RESOURCE SYSTEM,
Water Resources Board, Reading (England).
D. G. Jamieson.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Volume II, p 19-23. 1 fig, 5 ref.

Descriptors: *Water resources development, *Simulation analysis, *Regional analysis, Evaluation, Mathematical models, Optimization, *Planning, *Design, Reservoir storage, Computers, Computer programs, Water supply, Water quality, Systems analysis, Flow.
Identifiers: Storage capacity, Synthetic flow data.

In the United Kingdom, piecemeal promotion of new reservoir schemes by local authorities is being superseded by planned development of water resource systems on both a regional and national basis. Each new addition of storage is now considered as an element of a much larger system and must be assessed in conjunction with other existing and proposed storages in that system. Planning models have been formulated for purposes of identifying a limited number of near-optimal least-cost solutions for satisfying the forecast water demands. But since planning models are restricted to using simple evaluation routines, the assumptions made in deriving the near-optimal solutions need substantiating. This process is referred to as the design stage, its purpose being to define the storage capacity and pump sizes of each new element in order to meet the water demands on the total system and any water quality constraints with a given acceptable reliability. This paper considers the design stage of water resource planning; discussed are traditional techniques, simulation of water quantity, simulation of water quality, and optimization. (See also W76-12535) (Bell-Cornell)
W76-12540

APPLICATION OF DYNAMIC PROGRAMMING IN FRAMING OPERATING RULES FOR A MULTI-PURPOSE DAM,
Societe Grenobloise d' Etude et d' Applications Hydrauliques (France).
For primary bibliographic entry see Field 4A.
W76-12541

DYNAMIC PROGRAMMING FOR DETERMINATION OF A STORM WATER OUTLET SYSTEM OF PIPES AND FLOOD-DAMPING DAMS,
Societe Grenobloise d'Etude et d' Applications Hydrauliques (France).
For primary bibliographic entry see Field 4A.
W76-12542

INTEGRATED MATHEMATICAL MODELS USED FOR GROUNDWATER RESOURCES PLANNING IN AREAS INFLUENCED BY HUMAN SETTLEMENTS,.
Technische Universitaet, Hanover,(West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 4B.
W76-12543

OPTIMIZATION OF GROUNDWATER WITHDRAWALS WITH REGARD TO TECHNICAL AND HYDROLOGICAL CONSTRAINTS,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 4B.
W76-12544

INFLUENCE OF SPECIAL CONSTRUCTIONS IN REGIONAL WASTE WATER SYSTEMS AND THEIR ROLE IN MATHEMATICAL MODELS FOR PLANNING.
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 5D.
W76-12545

A QUANTITATIVE MODEL FOR THE PLANNING OF SURFACE WATER RESOURCES: USE OF MIXED VARIABLE LINEAR PROGRAMMING,
Ardour-Garonne Agency, Toulouse (France), Programming Group.
For primary bibliographic entry see Field 4A.
W76-12546

APPLICATION OF MATHEMATICAL MODELLING TO WATER QUALITY FORMATION PROCESSES FOR OPERATIVE MANAGEMENT OF COMPLEX WATER RESOURCES SYSTEMS,
Vsesoyuznyi Nauchno-Issledovtelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 5G.
W76-12547

EXPERIENCES WITH MATHEMATICAL MODELS USED FOR WATER QUALITY AND QUANTITY PROBLEMS,
Rijkswaterstaat, The Hague(Netherlands), Data Processing Div.
J. Voogt, and C. B. Vreugdenhil.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 52-87. 22 fig, 21 ref.

Descriptors: *Model studies, Water resources, *Water quality, Computers, *Methodology, Management, Drainage, Networks, Discharge(Water), Cooling water, Waste water(Pollution), Estuaries, Storage, Systems analysis, Water supply.
Identifiers: Morphological aspects.

The use of models of whatever kind is prompted by the fact that they enable us to study and understand processes under existing or future conditions without interfering with the actual prototype situation. Presented is a detailed, comprehensive study of the use of mathematical modeling to solve water quality and quantity problems. Considered are computational methods, including one- and two-dimensional models. A number of one-dimensional problems is discussed: (1) water management in drainage networks; (2) water management in the Delta (Netherlands) region; (3) high discharges along the Rhine branches; (4) cooling water circulation; (5) water quality in storage basins; and (6) waste water in estuaries. Two-dimensional problems studied are: (1) waste concentrations on the coast; (2) waste water in estuaries; and (3) steady flow in lakes. Discussed finally are morphological aspects. In conclusion, in many cases it is possible to obtain reasonable results with fairly simple tools. A major drawback is that many models contain some empirical parameters which must be determined anew for each new application. (See also W76-12535) (Bell-Cornell)
W76-12548

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY'S STORM WATER MANAGEMENT MODEL,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5G.
W76-12549

RIVER SYSTEM MODELLING FOR OPERATIONAL FORECASTING,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
For primary bibliographic entry see Field 4A.
W76-12550

SYSTEMS SIMULATION AS A TOOL FOR WATER RESOURCE PLANNING, INCLUDING QUALITATIVE ASPECTS,
Bureau of Reclamation, Denver, Colo. Research and Engineering Center.
For primary bibliographic entry see Field 4A.
W76-12551

THE SOLUTION OF THE REGIONALIZATION PROBLEM BY CERTAIN BRANCH-AND-BOUND METHODS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlegen und Wasserversorgung.
For primary bibliographic entry see Field 5D.
W76-12552

SURFACE WATER AND GROUND WATER INTERACTION PHENOMENA IN PLANNING MODELS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4B.
W76-12553

MATHEMATICAL SIMULATION AND OPTIMIZATION OF FLOOD CONTROL SYSTEMS,
Belorusskii Central Research Inst. for Water Resources, Minsk.
For primary bibliographic entry see Field 4A.
W76-12554

SIMULATION MODEL OF THE QUANTITATIVE AND QUALITATIVE EVOLUTION OF WATER RESOURCES AT DIFFERENT POINTS OF A RIVER-BASIN (ORNE),
Financial Agency of the Basin 'Seine-Normandie', Paris(France). Water Resources Div.
For primary bibliographic entry see Field 4A.
W76-12555

THE 'POLPOLE' MODEL: AN ATTEMPT TO ANALYSE THE WATER SYSTEM IN THE FINANCIAL AGENCY OF A FRENCH RIVER BASIN,
Financial Agency of the Basin 'Seine-Normandie', Paris (France).
For primary bibliographic entry see Field 4A.
W76-12556

USE OF INVESTMENT MODELS FOR THE LONG-TERM PLANNING OF A WATER RESOURCE SYSTEM FOR ENGLAND AND WALES,
Water Resources Board, Reading (England).
K. F. Clarke.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 137-143. 1 fig, 3 ref.

Descriptors: *Water resources development, *Long-term planning, *Investment, *Alternative planning, *Simulation analysis, Computers, Computer programs, Analytical techniques, Mathematical models, Optimization, Linear programming, Constraints, Economics, Water demand, Systems analysis.
Identifiers: *England, *Wales, Integer programming, Cost minimization.

The geographical and temporal distribution of rainfall in England and Wales causes a problem of water conservation and creates the need for a comprehensive strategy of water resources development. This article describes a modeling methodology for determining an economically optimal development, including the capital investment decision of which resources to develop and the decision of which demand centers to supply. Using integer programming, the first model provides a full search of the alternative development programs and minimizes the objective function. Then a simulation model, based on a suite of programs, computes annual water allocations and a detailed breakdown of costs. The six basic stages in the simulation model analysis are outlined. Included is the determination of the optimal plan of the staging and sizing of pipe and pumps. The maximum flow is used to size the plant and the average flow is used in computing the running costs. The final stage computes the total annual incidence of costs and discounted costs. (See also W76-12535) (Bell-Cornell)
W76-12557

USE OF OPTIMIZATION MODELS FOR WATER RESOURCES ALLOCATION AND CHOICE OF INVESTMENTS BY MEANS OF COMPUTERS,
Research and Design Inst. for Water Resources Engineering, Bucharest (Rumania). Water Economy Section.
C. Parvulescu.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 144-150. 4 fig, 1 ref.

Descriptors: *Water resources development, *Methodology, *Water allocation(Policy), *Planning, Optimization, Investment, Computers, Economics, Hydrologic aspects, Dynamic programming, Simulation analysis, Equations, Systems analysis.
Identifiers: Cost minimization.

Presented is a method for water resources development planning and allocation intended to eliminate as much as possible the drawbacks of existing methods. Given the growing complexity of water management problems, most methods are insufficient. Existing methods artificially divide into fragments the unitary character both of water utilization phenomena and water resources development systems. Moreover, problems of quality and quantity are approached separately. Not enough consideration is given the interrelationship between the internal expenses of water users and the external expenses of water resources developmet works. Assumptions and principles of the proposed method are given. Considered are the elements and relationships regarding the technological and economical aspects of water utilization by each user. Using the new methodology, optimization of the dimensioning and operation elements of a water system is considered. The optimization criterion is to minimize system costs. Utilized are dynamic programming and simulation analysis. Advantages of the method include: the possibility of establishing the transition moment from the natural flow regime to the developed flow regime of the source; and allowance for a judicious calculus of penalties that must be paid by the water users that deviate from optimal strategy of system dimensioning or operation. (See also W76-12535) (Bell-Cornell)
W76-12558

TASAM, A METHOD FOR SETTING GOALS, EVALUATING AND COMPARING PLANS,
KM Insinooritoimisto oy Kauppamiehentie, Tapiola (Finland).
A. Jaatinen.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 151-154.

Descriptors: *Evaluation, *Planning, *Computers, *Methodology, Decision making, Water

resources, Environment, Resources allocation, Benefits, Value.
Identifiers: Goals, *TASAM method, *Goal hierarchy.

Consciousness of goals in planning and assessing the value of plans in relation to the realization of a set of goals are becoming the most important phases in the entire planning process. The more comprehensive the planning, the more the quantity and contradiction of the goals set for the results of the planning increase. Presented is TASAM, a computer method which helps decision makers achieve goal-setting and evaluation of plans by means of a simple and systematic process. As problems become more complex, it enables the handling of goals in different mutual logic relationships. The method makes possible the evaluation of matters that cannot be assessed in terms of money or other measuring units. In addition, the improvability information derived from TASAM enables the allocation of the resources available in the best way possible. (See also W76-12535) (Bell-Cornell)
W76-12559

THE APPLICATION OF MATHEMATICAL MODELS AND OPTIMIZATION TECHNIQUES IN PLANNING WATER SUPPLY AND WASTE WATER DISPOSAL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. A. Deininger.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 154-157. 1 ref.

Descriptors: *Water supply development, *Waste water disposal, *Planning, *Optimization, Mathematical models, Decision maing, *Water resources, Water quality, River basins, Water quality control, *Environmental control, Systems analysis.
Identifiers: *Developing countries, Health improvement.

The World Health Organization believes firmly that mathematical models and optimization techniques play an important role in solving the problems of environmental control for the improvement of the health of the population, particularly in developing countries. Considered herein is the use of these methods by planners and engineers as tools providing increased capabilities of generating information that can be used in the decision-making process. Discussed also are water supply models and waste water disposal models. WHO is actively using these techniques in many projects to varying degrees; they have become important aids for modern environmental health engineers and planners. (See also W76-12535) (Bell-Cornell)
W76-12560

USE OF INVESTMENT MODELS AND CHOICE OF ALTERNATIVE DECISIONS FOR THE OPTIMUM DISTRIBUTION OF WATER RESOURCES AT THE STAGE OF PLANNING BY MEANS OF COMPUTERS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
V. K. Papisov, Oziransky, A. V. Abramova, and V. V. Rappoport.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 157-162. append.

Descriptors: *Water distribution(Applied), *Water resources, *Long-term planning, *Economics, *Optimization, Alternative planning, Computers, Investment, Decision making, River basins, Water supply, Simulation analysis, Mathematical models, Equations, Systems analysis.
Identifiers: *USSR, Cost minimization, Multivariant analysis.

The optimum distribution of water resources of a country by areas and branches of the national economy is the necessary condition for their rational use, expecially in the territorial redistribution of river flow. In the USSR, different variants of using water resources are assessed from the viewpoint of investments for the creating of national economy complexes. Hence models for optimizing water distribution are investment-type models. Financial expenditures include annual operation expenses and depreciation. Choice of the optimum variant of the distribution of water resources is made by the minimum of the 'discounted' expenditure. This report deals with a model for optimizing the use of interbasinflow transfer by the branches of the national economy and areas on the stage of designing and long-term planning. For problem solution, a model of inter-area, inter-branch and intra-brach optimization has been elaborated, simulating an upper level of the development of the economy. The model consists of hierarchically subordinated blocks describing a complex economic system. (See also W76-12535) (Bell-Cornell)
W76-12561

ELABORATION AND USE OF A MATHEMATICAL MODEL TO FORECAST IN QUANTITY AND QUALITY, THE WATER DEMANDS OF VARIOUS SECTORS OF INDUSTRY,
Societe du Canal de Provence et d'Amenagement de la Region Provencale Le Tholonet, Aix-en-Provence (France).
For primary bibliographic entry see Field 6D.
W76-12562

OPTIMAL DEVELOPMENT PROGRAMME FOR REGIONAL WATER SUPPLY SYSTEMS,
National Water Authority, Budapest (Hungary).
I. Orloci.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 166-169.

Descriptors: *Water supply development, *Regional development, *Economics, *Optimization, *Mathematical models, Water demand, Systems analysis.
Identifiers: *Hungary, Cost minimization.

This article considers an economic optimization model which has been applied in preparing a water supply development program in an important industrial region of Hungary. The model is associated with economic measures which are realized in the increase of the capacity of waterworks. The criterion for optimal operation is the sum of damages due to unsatisfied demands resulting from the expensiveness of measures and the limited funds of investment. The model is divided into three main parts: (1) the background of operation, comprising the natural-social processes; (2) the siting model, involving the building-block system construction of potential engineering solutions; and (3) the scheduling of investments. In the course of mechanical computations, the optimal parameters of the water supply system corresponding to average evolution have been determined on the basis of about 500 criteria from around 800 decision alternatives. (See also W76-12535) (Bell-Cornell)
W76-12563

SIMPLIFIED DECISION MODEL FOR NATIONAL WATER SUPPLY DEVELOPMENT,
National Water Authority, Budapest (Hungary).
J. Csuka.
The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 169-174. 1 fig, 8 equ.

Descriptors: *Water supply development, *Water management(Applied), *Decision making, *Long-term planning, *Regional analysis, *Linear programming, Optimization, Equations, Waste water(Pollution), Water quality, Stochastic processes, Projects, Systems analysis.
Identifiers: *Hungary, Developing countries.

In the evolution of water management, the complete, comprehensive control of runoff, as well as the utilization of water resources to the maximum possible engineering and economic benefits at the simultaneous observation of the highly complex interrelations between regional, sectorial, social and economic interests, emerge as problems of growing significance. The main problems of decision making to meet these demands and a scheme of the system of mathematical models corresponding is given. The decision is directed at the determination of the combination of water management hydro-technical projects satisfying optimally various interests, with due consideration to economic, natural legal, political and social interrelations and allowance for the laws of physics, as well as for other effects anticipated in other domains of life and the natural environment. A long-range planning model for water supply has been evolved in Hungary. The model is a linear, deterministic programming model which functions dynamically by the determination and defined interrelations of its variables. (See also W76-12535) (Bell-Cornell)
W76-12564

COMPUTER APPLICATION IN PROCESSING TECHNICAL AND ECONOMIC DATA FOR OPTIMIZING COMPLEX WATER RESOURCES SYSTEMS,
Belorussian Central Research Inst. for Water resources, Minsk.
A. N. Kolobaev, and A. V. Skatchek.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. April 1974, Vol. II, p 175-177.

Descriptors: *Water resources development, Computers, *Economics, *Optimization, *Data processing, Data transmission, Data collections, *Computer programs, Comprehensive planning, Systems analysis.
Identifiers: USSR.

The large-scale development of water resources systems imposes more stringent requirements for water object design, construction, and operation. One of these is to make technical and economic provisions for water projects. Great progress has recently been made in the USSR in developing optimization methods for water resources systems, but a lack of needed statistical, project, and economic planning information impedes the introduction of advanced mathematical-economical models and hampers efficient management. The introduction of a system for data collection, transmission, processing and analysis, the development of methods for water resources optimization, and the large-scale application of automatic devices and instruments facilitate transition to automatic optimized water resources management systems. Listed herein are the optimization tasks, the basic information needed to solve operating conditions optimization tasks, and the technical and economic data required for systems optimization. The use of computers to facilitate the comprehensive, complex information gathering, storage and retrieval is discussed. (See also W76-12535) (Bell-Cornell)
W76-12565

CONSTRUCTION AND UTILIZATION OF COMPLEX MATHEMATICAL MODELS IN THE PLANNING OF THE OPTIMAL DEVELOPMENT OF LARGE HYDROGRAPHIC SYSTEMS AND RIVER BASINS,
Ecole Nationle Superieure des Mines de Paris, Fontainebleau(France). Center for Geological Information.
For primary bibliographic entry see Field 4A.
W76-12566

THE RECREATIONAL USE OF WATER AS PART OF THE INTEGRATED PLANNING OF LARGE WATER SYSTEMS,
National Water Board of Finland, Helsinki. Office for Water Pollution and Recreation Use of Waters.
For primary bibliographic entry see Field 6B.
W76-12567

AN APPROACH TO RESEARCH ADMINISTRATION,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6B.
W76-12575

6B. Evaluation Process

THE WINOOSKI WORKSHOPS: AN ASSESSMENT OF SPECIFIED WORKSHOP TECHNIQUES FOR STIMULATING AND IMPROVING PUBLIC INVOLVEMENT IN WATER RESOURCES,
Vermont Univ., Burlington. Water Resources Research Center.
A. S. Wilm, and K. L. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 545, $5.00 in paper copy, $3.00 in microfiche. Completion Report, (1975). 90 p, 4 fig, 9 tab, 56 ref. OWRT A-020-Vt(1). 14-31-0001-5046.

Descriptors: Communication, River basins, Water resources, *Social participation, *Vermont, Water quality, Planning, Social aspects, *Attitudes.
Identifiers: *Public participation, *Winooski River Basin(Vt).

Public participation is a dynamic communication process within a social system, a source of information and support for social and economic goals. Current interest in citizen participation is sparked by changes in social values and more specifically by a change in the public's perception of government responsibility. Vermont is drawing up its River Basin Water Quality plans for the major rivers of the State. Agencies have called for citizen input. This provided an opportunity to test a commonly used workshop technique for involving citizens against a second format which involved a more social-psychological orientation and small group problem-solving techniques. The purpose of this project was to test the hypothesis that differences in environmental settings reflect, and are reflected in citizen motivation levels to become involved in water resource decision-making. Two distinctly different types of meetings were held in the Winooski River Basin. A secondary focus was an analysis of citizen motivations to become involved as reflected in questionnaire responses and attendance rates. Participants for this study were found by use of a variation of the technique developed to identify 'community influentials'. Differences found, due to the environmental settings, reflect research findings observed in more 'controlled' experimentation.
W76-12151

ALLOWANCE FOR THE STOCHASTIC CHARACTER OF HYDROLOGICAL DATA IN WATER PROJECT DECISIONS,
National Water Authority, Budapest (Hungary). Engineering Secretariat.
For primary bibliographic entry see Field 7A.
W76-12439

ECONOMIC UNCERTAINTIES IN WATER RESOURCES PROJECT DESIGN,
Eotovs Lorand Univ., Budapest(Hungary).
For primary bibliographic entry see Field 6A.
W76-12514

A DYNAMIC REGIONAL MODEL FOR EVALUATING RESOURCE DEVELOPMENT PROGRAMS,
Manitoba Univ., Winnipeg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4A.
W76-12520

A STUDY OF RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL ENGINEERING USING SYSTEM APPROACH,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
M. Thompson.
Research Report, RR-74-13, International Institute for Applied Systems Analysis, Laxenburg, Austria, August 1974. 54 p, 3 fig.

Descriptors: *Research and development, *Environmental engineering, *Systems analysis, *Social aspects, Mathematical models, Management, Water quality, Air pollution, Effects, Economics, Political aspects, Standards, Monitoring, Disasters.
Identifiers: Information flow network, Incentives, International level.

Established is a systems conception for problems of the environment which will serve as foundation for eleven recommendations upon the ways in which research and development efforts in this area may beneficially be redirected. Scientific and managemental approaches to the environment have become fettered by a narrowness of perspective that has limited their potential contributions. Viewpoints adopted in directing and performing research activities should be broadened (1) in geographical extent, (2) in conceptual reach, (3) to embrace more environmental systems, (4) to consider natural systems explicitly, (5) to account for the interconnections of the environment with other social systems, and (6) to heed the social system through which the environment is maintained. Presented are three models of the encompassing social system as it affects the environment. The models feature: a micro-economic view of the firms and households which may despoil the environment; the basic political mechanisms through which environmental wrongs can be set right; and the network of information flows necessary to manage the environment. These systems are examined to identify their weaknesses and discover points of leverage where improvements may be effected. Special attention is devoted to: the distributional equity of proposed policies; the possibilities for direct management of environmental systems; the need for preparation in advance of environmental disasters, the establishment of standards, and environmental monitoring. Finally, the study identifies environmental responsibilities at the international level which crucially require fulfillment. (Bell-Cornell)
W76-12533

EVALUATING TISZA RIVER BASIN DEVELOPMENT PLANS USING MULTIATTRIBUTE UTILITY THEORY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-12534

THE USE OF COMPUTER TECHNIQUES AND AUTOMATION FOR WATER RESOURCES SYSTEMS.
Economic Commission for Europe (UN), New York. Committee on Water Problems, Economic and Social Council.
For primary bibliographic entry see Field 6A.
W76-12535

PRESENT SITUATION AND TRENDS IN THE APPLICATION OF ADVANCED METHODS AND TECHNIQUES FOR WATER RESOURCES MANAGEMENT.
Economic Commission for Europe (UN), New York.
For primary bibliographic entry see Field 7C.
W76-12536

OPTIONS OF DEVELOPMENT AND INTEGRATED MANAGEMENT OF WATER RESOURCES,
Ecole Nationale Superieure des Mines de Paris, Fontaine-bleau (France). Center for Geological Information.
Y. Emsellem.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C. 1974, Volume II, p 11-15.

Descriptors: *Water resources development, *Management, *Planning, *Methodology, *Cost-benefit analysis, Optimum development plans, Hydraulic systems, Economics, Mathematical models, Environment, Comprehensive planning, Water pollution control.
Identifiers: *France, Multiple objectives.

Planning for the management and use of water resources depends first on the political aims of development and secondly on the consequences induced by the application of these programs. The characteristic of these two types of variables is to imply essentially an important part of nonnumerical values. More precisely, the classical cost-benefit analysis only takes into account the market values. However, for progress, a larger methodology, taking into consideration the nonnumerical character of the out-of-market variables of the environment is needed and has been developed. In order to develop concrete procedures, a group of nine inter-disciplinary teams is experimenting on the 115.000 sq. km. basin of the Agence Financiere 'Adour-Garonne' in France. The general attempt is to build as large as possible, using the best available tools, and to study the different aspects related with complex problems, such as the variations of certain parameters with policy. Since programming helps to clarify and optimize the objective function and big computers may handle large systems efficiently, the natural method is to try and represent the problems by a model which can be programmed. (See also W76-12535) (Bell-Cornell)
W76-12538

SURFACE WATER AND GROUND WATER INTERACTION PHENOMENA IN PLANNING MODELS,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4B.
W76-12553

USE OF INVESTMENT MODELS FOR THE LONG-TERM PLANNING OF A WATER RESOURCE SYSTEM FOR ENGLAND AND WALES,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 6A.
W76-12557

USE OF OPTIMIZATION MODELS FOR WATER RESOURCES ALLOCATION AND CHOICE OF INVESTMENTS BY MEANS OF COMPUTERS,
Research and Design Inst. for Water Resources Engineering, Bucharest (Rumania). Water Economy Section.
For primary bibliographic entry see Field 6A.
W76-12558

TASAM, A METHOD FOR SETTING GOALS, EVALUATING AND COMPARING PLANS,
KM Insinooritoimisto oy Kauppamiehentie, Tapiola (Finland).
For primary bibliographic entry see Field 6A.

W76-12559

USE OF INVESTMENT MODELS AND CHOICE OF ALTERNATIVE DECISIONS FOR THE OPTIMUM DISTRIBUTION OF WATER RESOURCES AT THE STAGE OF PLANNING BY MEANS OF COMPUTERS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 6A.
W76-12561

SIMPLIFIED DECISION MODEL FOR NATIONAL WATER SUPPLY DEVELOPMENT,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-12564

COMPUTER APPLICATION IN PROCESSING TECHNICAL AND ECONOMIC DATA FOR OPTIMIZING COMPLEX WATER RESOURCES SYSTEMS,
Belorussian Central Research Inst. for Water resources, Minsk.
For primary bibliographic entry see Field 6A.
W76-12565

THE RECREATIONAL USE OF WATER AS PART OF THE INTEGRATED PLANNING OF LARGE WATER SYSTEMS,
National Water Board of Finland, Helsinki. Office for Water Pollution and Recreation Use of Waters.
M. Sarkka.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol II, p 180-186.

Descriptors: *Recreation, *Water utilization, *Planning, *Water resources, *Lake shores, Computers, Estimating, Boats, Environment, Beaches, Swimming, Water pollution, Mathematical models, Methodology, Systems analysis, Regional analysis.
Identifiers: *Finland, Regional planning.

Since the 1950s, the recreational use of water has developed to such a high extent in Finland that it now plays a very central role in all forms of regional planning. This article considers mathematical models for various types of data processing and outlines some examples of applications of planning techniques for recreational uses of watercourses. Considered are: estimation of volume of boat traffic; classification of lake shores from the viewpoint of recreational use; classification of lakes and their shores with a view to recreational use and environmental protection in regional planning; estimation of beaches' suitability for swimming on the basis of factors that influence this appropriateness; and a study of recreational uses of watercourses in the Lohja District. (See also W76-12535) (Bell-Cornell)
W76-12567

AN APPROACH TO RESEARCH ADMINISTRATION,
Texas Univ. at Austin. Center for Research in Water Resources.
J. Zimmerman.
Completion Report, December 1975. 49 p, 31 ref. OWRT X-146 (4270)(1).

Descriptors: *Research and Development, *Water resources development, *Resources development, *Comprehensive planning, Evaluation, Energy budget, Water demand, Water requirements, Water management, Water supply, Analytical techniques, *Research priorities, *Great Plains, Energy.
Identifiers: Research implementation, Problem identification research, Innovation research, *Feasibility reserach, Consequences research(Northern Great Plains), Research administration.

A procedure is described for analyzing research problem areas, identifying possible courses of research, selecting alternative courses, comparatively evaluating such courses and implementing research activities. Types of research that are needed in the course of problem solving are problem identification research, innovation research, feasibility research and consequences research. This general approach to research administration is partially illustrated in relation to the problem of increasing water supplies for energy production in the northern Great Plains region.
W76-12575

BENEFIT COST ANALYSIS--A NECESSARY PART OF ENVIRONMENTAL DECISIONING,
Minnesota Univ., Duluth. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W76-12576

NORTHEASTERN UNITED STATES WATER SUPPLY STUDY, INTERIM REPORT, CRITICAL CHOICES FOR CRITICAL YEARS.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 6D.
W76-12584

OUTDOOR RECREATION PLANNING AND RESEARCH IN THE U.S.A.,
National Foundation for Scientific Research (NFWO), Ghent (Belgium).
E. Van de Walle.
Research report, No. 2, November, 1975. 49 p.

Descriptors: *Planning, *Recreation, *Recreation facilities, *National recreation areas, Parks, Bureau of Outdoor Recreation(BOR), Government, Texas, Washington DC, Michigan, Wisconsin, Colorado, Wyoming, Utah, California.
Identifiers: Outdoor recreation, *Outdoor recreation research, Statewide Comprehensive Outdoor Recreation Plan(SCORP), Nationwide Outdoor Recreation Plan.

Information is presented on the organization of outdoor recreation research in the United States, listing of recreation specialists contacted, comments concerning important U.S. research reports and books on the subject, and a portion of the results obtained in the study. The study includes sections on Texas, Washington, D.C., Michigan, Wisconsin, Colorado, Wyoming, Utah and California. Various public agencies, Federal and State, are discussed in some detail. Concluding remarks indicate that public involvement in providing recreation opportunity at all levels is an essential element. Three federal departments have major research responsibilities: (1) the Department of the Interior, where the Bureau of Outdoor Recreation concentrates on nationwide planning with statewide outdoor recreation coordinated through regional offices. Research is conducted by universities or independent institutions under BOR sponsorship; (2) The Department of Agriculture where research is conducted by regional Forest Range and Experiment Stations and Agricultural Experiment Stations; (3) The Corps of Engineers which has an active research program related to future reservoir planning. Almost all research programs at the state level are related to the Statewide Comprehensive Outdoor Recreation Plan (SCORP). A multiple regression analysis is used to determine the influence of socio-economic factors and independent variables upon participation rates. It is thought that Western European countries can benefit from studying the way recreation planning is done in the U.S., though the vastness of the land obviously gives recreation in the U.S. some unique characteristics. (Smith - North Carolina)
W76-12585

MANAGEMENT OF WATER RESOURCES UNDER DIFFERENT SOCIO-ECONOMIC CONDITIONS,
Arizona Univ., Tucson.
S. M. H. Bokhari.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 76-11, 320. Ph.D. Thesis, 1975, 306 p.

Descriptors: *Water management(Applied), *Planning, *Social aspects, *Regional economics, *Regional development, Regional analysis, United States, Asia.
Identifiers: *Pakistan, Welton-Mohawk Irrigation District.

Major lags still exist between the developed and developing countries with respect to water management, and theory and practices diverge even in the developed countries. The Welton-Mohawk Irrigation District in the United States and the Salinity Control and Reclamation Project Number One in Pakistan are compared as examples of water management under different sociological conditions. Multi-disciplinary teams of professionals from developing countries should be trained to make planning and management more effective. Implementation capabilities in developing countries should be improved, so that projects can be completed more rapidly. Adequate financial allocation is required during implementation and operation. The latest rain harvesting and runoff agricultural techniques should be introduced in dry farming area in Pakistan's upland plateau. Tubewells will make the system more flexible and save funds for important complementary programs. There should be more emphasis on planning, operations, and evaluation of public investments concerned with water. (Snyder-FIRL)
W76-12626

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ENERGY COSTS OF WASTEWATER REUSE,
Arizona Univ., Tucson. Economic and Business Research.
For primary bibliographic entry see Field 5D.
W76-12215

ECONOMIC COSTS OF CONTROLLING WATER QUALITY THROUGH MANAGEMENT OF IRRIGATION RETURN FLOWS,
Washington State Univ., Pullman. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12218

DISPOSAL ALTERNATIVES FOR INTERMITTENT SAND FILTER SCRAPINGS UTILIZATION AND SAND RECOVERY,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-12219

COST OF WATER POLLUTION CONTROL IN THE CARPET INDUSTRY,
Exxon Research and Engineering Co., Florham Park, N.J. Water Pollution Control Section.
For primary bibliographic entry see Field 5G.
W76-12422

COST FUNCTIONS FOR WASTEWATER CONVEYANCE SYSTEMS,
Louvain Univ. (Belgium). Groupe de Travail en Economie de l'Environnement.
For primary bibliographic entry see Field 5D.
W76-12513

AVERAGE RISE OF EPA PLANT, SEWER INDEXES SLOWS.
For primary bibliographic entry see Field 5D.
W76-12598

SEWAGE PLANT UPGRADES EFFLUENT.
For primary bibliographic entry see Field 5D.
W76-12613

6D. Water Demand

PRELIMINARY ANALYSIS OF GEOHYDROLOGIC DATA FROM TEST WELLS DRILLED NEAR CHALK POINT, PRINCE GEORGES COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W76-12289

IMPACT OF HURRICANE TIDAL SURGES ON SUBSEQUENT LAND USE CHANGES AND WATER RESOURCES REALLOCATION,
University of Southern Mississippi, Hattiesburg. Dept. of Geography and Area Development.
For primary bibliographic entry see Field 4A.
W76-12461

ELABORATION AND USE OF A MATHEMATICAL MODEL TO FORECAST IN QUANTITY AND QUALITY, THE WATER DEMANDS OF VARIOUS SECTORS OF INDUSTRY,
Sôciete du Canal de Provence et d'Amenagement de la Region Provencale Le Tholonet, Aix-en-Provence (France).
C. Bareau.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., April 1974, Vol. II, p 163-165. 1 tab.

Descriptors: *Water supply, *Forecasting, *Industrial water, *Water quality, Water demand, Industries, Planning, Hydraulics, Methodology, Management.
Identifiers: *Southwestern France.

In hydraulics development schemes, supply and demand are expressed by the same physical quantity. From such data, planning bodies try to optimize water supply management to meet various potential uses. Today, this methodology is no longer satisfactory; the supply concept itself must be re-defined. Water management patterns must account for each and every parameter of quality. Presented is a method for forecasting industrial water supply. To each area of use, the pattern connects a five-dimensional request vector, determined from an inquiry made in southwestern France. Five ranges of water use for manufacturers have been examined: (1) waters used for conveyance; (2) cooling waters; (3) heating waters; (4) manufacture waters; and (5) sanitary and home waters. Results show that factories having identical products manufactured require very different unitary water quantity vectors. The results are aggregated for the whole industrial areas of the investigated zone, including the five uses mentioned and seven activity areas corresponding to an industrial amalgamation used in the national statistics. (See also W76-12535) (Bell-Cornell)
W76-12562

NORTHEASTERN UNITED STATES WATER SUPPLY STUDY, INTERIM REPORT, CRITICAL CHOICES FOR CRITICAL YEARS.
Army Engineer Div. North Atlantic, New York.
November 1975. 89 p, 16 fig, 7 tab, 97 ref.

Descriptors: *Water supply, *Water demand, *Water shortage, *Water resources development, Population, *New York, *Massachusetts, *Rhode Island, *Water management, Water quality, Water reuse, Water yield improvement, Droughts, Planning, *District of Columbia.
Identifiers: *Washington Metropolitan Area, *New York Metropolitan Area, *Eastern Massachusetts-Rhode Island Metropolitan Area.

Critical problems of developing water supply sources to meet growing demand are foreseen in the next 20 to 25 years for 3 metropolitan areas, Washington, New York and Eastern Massachusetts-Rhode Island. Major alternatives for water supply, along with advantages and disadvantages, are examined so that responsible government decisions can be made. Population projections were used to year 2020 to predict water demand. Possible supply alternatives were identified for each area to determine critical needs. By 2020 population of 80 million is predicted for this region which extends from Maine to Virginia. Along with the 3 critical metropolitan areas explored here, 26 other urban areas with potential long range problems have been studied in a separate report. Solutions offered must meet 4 criteria: reliability, flexibility, timeliness, and equity. Underlying premises are: demand will increase with population and economic growth, direct reuse of waste water will not be widely accepted, there will be no changes in ownership of water supplies, droughts will continue to occur, and demand cannot be materially reduced through legislation or changing habits before the 1990s. No major water supply projects have been built in the critical areas since the 1960s yet safe yields in some systems have been repeatedly surpassed. It is noted that considerable increase in price (in multiples of 100%) is needed to affect demand. Sources, projects and illustrative combinations of projects are given for each critical area. Several branches of a decision tree are explored, each considering a different mix of goals such as cost, environmental quality, regional needs, reliability and equity. (Smith-North Carolina)
W76-12584

6E. Water Law and Institutions

GROUNDWATER PROPERTY RIGHTS AND CONTROVERSIES IN MONTANA,
Montana State Univ., Bozeman. Dept. of History, Government and Philosophy.
R. Dunbar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 516, $5.00 in paper copy, $3.00 in microfiche. Research Report No. 76, Montana University Joint Water Resources Research Center, Bozeman, April 1976, 75 p. OWRT A-059-MONT(1).

Descriptors: Water law, *Groundwater, *Property rights, *Water rights, *History, Prior appropriation, *Montana, Regulation.
Identifiers: *Water law history, *Montana water law.

When Montana was dubbed the Treasure State, few of her citizens were aware of the abundance of groundwater beneath their feet. Nor were they concerned about the property right in it, a right which their lawmakers had borrowed from the more humid states. However, as Montanans began to learn through hydrologic surveys the extent of the resource and to increase its exploitation, some farsighted individuals sought first to conserve it through regulation of the right and then to change the right itself. These efforts provoked controversies. Out of the crucible of these controversies, Montanans forged a new property right and new institutions to protect it. This report is an historical analysis and accounting of these controversies. (Holje-Montana State)
W76-12154

REFORM OF ILLINOIS WATER RESOURCE LAWS WITH PARTICULAR REFERENCE TO THE DRAINAGE CODE AND CLOSELY RELATED LAWS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
D. L. Uchtmann, and N. G. P. Krausz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 538, $5.00 in paper copy, $3.00 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 114, June 1976. 94 p, append. OWRT A-076-ILL(1). 14-31-0001-6014.

Descriptors: *Water districts, Organizations, *Jurisdiction, *Institutions, Governments, *Planning, Control, Regulation, Coordination, *Illinois, Water law, Water rights, Legal aspects, *State governments, Drainage districts, Legislation.
Identifiers: *Drainage codes(Law).

Laws affecting Illinois water resources form a highly complex and fragmented water resource system. Many special purpose or general governmental units have varying responsibility in areas of drainage, soil and water conservation, sewage treatment and water quality, water supply and use, flood control, recreation and navigation. This existing structure gives rise to numerous inherent problems. Each state adjoining Illinois has made significant changes in its system for administering and controlling water. In addition, Nebraska, Ohio and Florida have made significant changes in their water systems. The water law programs of these states have been analyzed to determine if procedures and structure might be adopted for Illinois. Regarding drainage laws, in particular, a survey of drainage district attorneys and engineers in Illinois identifies specific areas of dissatisfaction. The surveys also offer suggestions for improvement. Recommendations for reform of Illinois water resource laws include a long term reform of the overall structure. This long term recommendation includes the establishment of a state agency with broad powers in areas of general planning and coordination and the combining of many existing local special purpose districts into multi-purpose local districts. The recommendations also include specific changes to the existing drainage code that can be accomplished independent of the overall restructuring.
W76-12217

PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL GULF AND CARIBBEAN FISHERIES INSTITUTE.
Miami Univ., Fla.
For primary bibliographic entry see Field 6G.
W76-12226

MULTIPLE-USE CONFLICTS BETWEEN FISHERMEN AND OTHER USERS OF THE OCEAN WITH A CONSIDERATION OF A POSSIBLE EXPANDED FEDERAL ROLE,
National Oceanic and Atmospheric Administration, Rockville, Md., Office of Living Resources.
For primary bibliographic entry see Field 6G.
W76-12227

FLOOD-HAZARD EFFECTS ON RESIDENTIAL PROPERTY VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W76-12529

WATER QUALITY LAW IN FEDERAL REPUBLIC OF GERMANY,
Bonn Univ. (West Germany). Inst. fuer das Recht der Wasserwirtschft.
For primary bibliographic entry see Field 5G.
W76-12531

A LEGAL-HISTORICAL ANALYSIS OF NAVIGATION USER CHARGES,
Department of Environment, Ottawa (Ontario).
P. M. Ashton, C. Cooper-Ruska, and L. A. Shabman.

Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR1, p 89-100, April 1976. 32 ref.

Descriptors: *Water resources, *Navigation, Economics, History, Legislation, Water policy, Water law, Political aspects, Investment, Efficiencies, *Canada.
Identifiers: *Waterways(Transportation), *Navigation user charges.

Toll-free use of the nation's inland waterway transportation network is shown to be a political and economic anachronism. The historical development of this free-use policy is traced from the early days of promotion of regional economic development under the legal sanctions of the commerce Clause of the Constitution and the Northwest Ordinance. In an age of scarce funds for public works, the toll-free waterway program seems to be an outstanding candidate for application of the 'beneficiaries pay' principle. Equity considerations, promotion of efficiency between transport modes, and public investment efficiency considerations suggest that a revision might be legal in theory but would likely face substantial political opposition in practice. (Bell-Cornell)
W76-12532

THE 'POLPOLE' MODEL: AN ATTEMPT TO ANALYSE THE WATER SYSTEM IN THE FINANCIAL AGENCY OF A FRENCH RIVER BASIN,
Financial Agency of the Basin 'Seine-Normandie', Paris (France).
For primary bibliographic entry see Field 4A.
W76-12556

USE OF INVESTMENT MODELS FOR THE LONG-TERM PLANNING OF A WATER RESOURCE SYSTEM FOR ENGLAND AND WALES,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 6A.
W76-12557

A METHODOLOGY TO MEASURE THE PERFORMANCE OF THE EPA REGIONAL EIS REVIEW PROCESS,
Argonne National Lab., Ill. Energy and Environmental Studies Div.
For primary bibliographic entry see Field 6G.
W76-12583

OUTDOOR RECREATION PLANNING AND RESEARCH IN THE U.S.A.,
National Foundation for Scientific Research (NFWO), Ghent (Belgium).
For primary bibliographic entry see Field 6B.
W76-12585

6F. Nonstructural Alternatives

FLOOD DAMAGE REDUCTION POTENTIAL OF RIVER FORECAST SERVICES IN THE CONNECTICUT RIVER BASIN,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W76-12186

FLOOD HAZARD ANALYSES FOR LOWER MARSH CREEK (INCLUDING SELECTED TRIBUTARIES), BANNOCK COUNTY, IDAHO.
Soil Conservation Service, Boise, Idaho.
For primary bibliographic entry see Field 4A.
W76-12580

CLARKS CREEK FLOOD PLAIN STUDY, CATAWBA COUNTY, NORTH CAROLINA.
Soil Conservation Service, Raleigh, N. C.
For primary bibliographic entry see Field 4A.
W76-12582

FLOOD HAZARD ANALYSES REPORT: EAST BRANCH NIMISHILLEN CREEK, STARK COUNTY, OHIO.
Soil Conservation Service, Columbus, Ohio.
For primary bibliographic entry see Field 4A.
W76-12586

FLOOD HAZARD INFORMATION: BACKLICK CREEK, VIOLET TOWNSHIP, FAIRFIELD COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-12592

FLOOD PLAIN INFORMATION: FRESHWATER CREEK, HUMBOLDT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-12593

FLOOD PLAIN INFORMATION: YELLOW RIVER, PART III, METROPOLITAN ATLANTA, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-12595

6G. Ecologic Impact Of Water Development

COASTAL ENGINEERING CONFERENCE. FOURTEENTH. PROCEEDINGS. COPENHAGEN, DENMARK, JUNE 24-28, 1974.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 5G.
W76-12221

ENVIRONMENTAL ANALYSIS FOR BAHAMAS SUPERTANKER PORT,
Erindale College (Ontario).
For primary bibliographic entry see Field 5G.
W76-12222

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH A PIPELINE LANDFALL IN COASTAL DUNES AT CRUDEN BAY, ABERDEENSHIRE, SCOTLAND,
Aberdeen Univ. (Scotland).
For primary bibliographic entry see Field 5G.
W76-12223

OCEAN 72, IEEE INTERNATIONAL CONFERENCE ON ENGINEERING IN THE OCEAN.
Institute of Electrical and Electronics Engineers, Inc., New York.
For primary bibliographic entry see Field 5G.
W76-12224

ENVIRONMENTAL CONSIDERATIONS OF OFFSHORE GENERATING STATIONS,
Public Service Electric and Gas Co., Newark, N.J.
For primary bibliographic entry see Field 5G.
W76-12225

PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL GULF AND CARIBBEAN FISHERIES INSTITUTE.
Miami Univ., Fla.
Gulf and Caribbean Fisheries Institute Proceedings of the Twenty-Eighth Annual held in Bal Harbour, Florida, October, 1975, Published in May 1976. 113 p. J. B. Higman, (ed).

Descriptors: *Continental Shelf, *Environmental effects, Resources development, Water resources, *Fisheries, Biology, Conferences, Biota, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, New York Bight, Caribbean Sea.

A collection of 18 papers constitute the proceedings of the Twenty-Eighth Annual Gulf and Caribbean Fisheries Institute held October 1975 at Bal Harbour, Florida, under the sponsorship of the University of Miami and NOAA Sea Grant Program. Separate sessions were devoted to the subjects: Fisheries jurisdiction, Fisheries biology, and the Continental Shelf. A Fisheries workshop was included. (See W76-12227 thru W76-12229) (Sinha - OEIS)
W76-12226

MULTIPLE-USE CONFLICTS BETWEEN FISHERMEN AND OTHER USERS OF THE OCEAN WITH A CONSIDERATION OF A POSSIBLE EXPANDED FEDERAL ROLE,
National Oceanic and Atmospheric Administration, Rockville, Md., Office of Living Resources.
R. F. Smith.
In: Gulf and Caribbean Fisheries Institute, Proceedings, Twenty-Eight Annual held in Bal Harbour, Florida, October 1975, May 1976. p. 27-34.

Descriptors: *Continental Shelf, *Resources development, *Environmental effects, *Fisheries, *Recreation demand, *Commercial fishing, *Governmental interrelation, Coasts, Planning, Multiple purpose.
Identifiers: *Outer Continental Shelf.

This paper considers the various types of multiple-use conflicts faced by commercial fishermen, and reviews the role of the Federal Government in helping fishermen and workers in other industries to make a living on the same ocean at the same time. The physical, economic, and social aspects of ocean development that may affect the abilty of fishermen to function effectively under mounting multiple-use conflicts are discussed. These problems are not new; but they are no longer localized to a few fishing ports or on isolated fishing grounds. Instead, they occur coast-wide--indeed, worldwide. They are becoming far more complex and have potential impacts upon many more fishermen. The conflicts occur because of competition for ocean space and port facilities, competition for labor and service, and pressures upon the fishermen to change his life style. Such competition and pressures may cause injury, endanger lives, damage vessels and gear, create costly delays, or force a fisherman against his will into other occupations or social patterns. In summary, we are moving into an era of dramatically increasing activity and development throughout most of our continental shelf area. This will have a tremendous impact on the economy and social patterns in many of the nation's coastal communities, and the ultimate effects are difficult to predict. The fact is that there are no major technical problems impeding ocean development that are beyond the capacity of science and engineering to solve. The real problem is in the resolution of social economic, and other multiple-use conflicts. (See also W76-12226) (Sinha-OEIS)
W76-12227

IDENTIFICATION AND MAPPING OF FISHING BANKS ON THE OUTER CONTINENTAL SHELF OF THE GULF OF MEXICO,
Bureau of Land Management, New Orleans, La.
D. Elvers, and J. B. Johnston.
In: Gulf and Caribbean Fisheries Institute, Proceedings, Twenty-Eighth Annual held in Bal Harbour, Florida, October 1975, May 1976. p 35-48, 7 fig, 2 tab, 22 ref.

Descriptors: *Continental Shelf, *Gulf of Mexico, *Environmental effects, *Resources development, Water resources, *Leases, Fish, Management, Mapping, Drilling.
Identifiers: *Outer Continental Shelf, Fishing banks, Fishing grounds, Environmental impact.

The Bureau of Land Management (BLM) began leasing in Gulf federal waters for oil, gas, and sulfur in 1954. Between 1954 and 1971, 23 lease sales were held with the value of the prospects the principal factor guiding the sales. In 1971, formal environmental impact statement preparation began and by 1973 concern for fishing banks, shrimping area, shipwrecks, and coral reefs brought about special stipulations in the Florida Middle Ground, Stetson Bank, East and West Flower Garden banks, and 18 Fathom Lump. Fishing grounds related to bathymetric and geologic features for the Gulf of Mexico can be accurately mapped with modern navigation, side scan sonar, and narrow beam soundings. BLM hopes to add additional details to fishing grounds by use of BLM, NOS, and industry data taken in the course of special studies for impact statements, baseline investigations, archaeologic, and geologic hazard surveys for the Gulf of Mexico and South Atlantic continental shelf and slope. (See also W76-12226) (Sinha - OEIS)
W76-12228

CONTAMINANT EFFECTS ON BIOTA OF THE NEW YORK BIGHT,
State University of New York at Stony Brook. MESA New York Bight Project
For primary bibliographic entry see Field 5C.
W76-12229

BASIC REMOTE SENSING INVESTIGATIONS FOR BEACH RECONNAISSANCE: AN INTERIM REPORT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W76-12375

COMPARISON OF ECOLOGICAL IMPACTS OF POSTULATED OIL SPILLS AT SELECTED ALASKAN LOCATIONS. VOLUME I. INTRODUCTION, SUMMARY, METHODOLOGY, EVALUATION AND APPENDICES,
Mathematical Sciences Northwest, Inc., Bellevue, Wash.
For primary bibliographic entry see Field 5C.
W76-12379

TOXIC EFFECTS OF OIL DISCHARGED FROM SHIPS,
Exxon Research and Engineering Co., Linden, N.J. Government Research Labs.
For primary bibliographic entry see Field 5C.
W76-12380

SAND LEVEL CHANGES ON TORREY PINES BEACH, CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W76-12383

ANALYSIS OF THE ROLE OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas Engineering Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W76-12389

ENVIRONMENTAL IMPLICATIONS OF MAINTENANCE AND IMPROVEMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Coll. of Agriculture.
For primary bibliographic entry see Field 5G.
W76-12390

IMPACT OF A MAINSTREAM IMPOUNDMENT ON THE FISH FAUNA OF BIG WALNUT CREEK A SCIOTO RIVER TRIBUTARY IN CENTRAL OHIO,
Ohio State Univ., Columbus. Dept. of Zoology.
T. M. Cavender, and R. L. Crunkilton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 844, $7.50 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Project Completion Report No. 449, (1976). 191 p, 9 fig, 24 tab, 27 ref. OWRT A-037-OHIO(1).

Descriptors: *Stream fisheries, Dams, *Fish migration, Aquatic environment, *Reservoir fisheries, *Warm-water fish, Sport fish, Rough fish, Water analysis, Temperature, Dissolved oxygen, Pre-impoundment, Post-impoundment, *Fish behavior, *Ohio, Turbidity, Ecology, *Environmental effects, Correlation analysis, Impoundments, *Fish food organisms.
Identifiers: *Fish species diversity, *Big Walnut Creek(Ohio), Hoover Reservoir(Ohio), Scioto River tributory(Ohio).

The accumulated effects of impoundment on Hoover Reservoir have altered the composition and distribution of fishes in Big Walnut Creek. These changes in part have resulted from inundation of the stream channel, prevention of migration, alteration in water velocity, substrate turbidity, temperature and dissolved oxygen. These alterations either directly or indirectly affect species by changing the stream's ecology. Temperature was reduced significantly in the tailwater area affecting the reproductive biology of as many as 22 species of fish that normally migrate to spawn. Turbidity levels fluctuated widely, but were dampened in the tailwater area due to settling action in the reservoir allowing two species of turbidity-intolerant fish to become established. Dissolved oxygen levels never fell below the recommended level of 5 ppm, but the effects of a reduced oxygen level on food organisms are unknown. Widespread changes in the overall fish fauna of Big Walnut occurred as a result of impoundment. Five separate statistical analyses demonstrated these changes. In addition to commonly used indices, a new technique, correlation analysis, was a useful tool in describing how the associations between fish species in communities are changed by impoundment. It was established that diversity (H) at selected stations above and below Hoover Reservoir on Big Walnut remained unchanged, while significant changes occurred in the qualitative makeup of the fish fauna. This indicates that diversity (H) used in conjunction with descriptive analysis provides an overall description of changes resulting from stream impoundment.
W76-12465

INTERDISCIPLINARY MODELS OF WATER SYSTEMS,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 6A.
W76-12516

QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL IMPACT,
Parsons (Ralph M.) Co., Pasadena, Calif. Systems Div.
B. Loran.
Journal of Environmental Systems, Vol 5, No 4, p 247-256, 1975. 2 fig, 8 ref.

Descriptors: *Environment, *Assessment, History, Projects, Algorithms, Waste water treatment, Treatment facilities, Decision making, Water quality, Construction, Operations, Systems analysis, Administrative agencies.
Identifiers: *Environmental impact assessment, Value ratings.

The history of environmental impact and the current requirements, guidelines, and coverage of environmental impact statements are briefly reviewed. A procedure for the assessment of environmental impact is presented. The individual components of the environment induced by a proposed action and of the natural environment of the project area are listed, and each impact generated by their interaction is assigned value ratings. The ratings are assembled in an impact-incidence matrix, which is then reordered using a data analysis technique, the bond energy algorithm. The new matrix obtained displays interrelated clusters of high-valued ratings, corresponding to critical environmental areas. The impacts comprising each area are grouped according to similarity of action and effect, and their association may suggest environmental alternatives. The environmental impact from the construction of an additional wastewater treatment plant in a resort area is assessed to illustrate the effectiveness of the procedure. (Bell-Cornell)
W76-12528

FLOOD-HAZARD EFFECTS ON RESIDENTIAL PROPERTY VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman, and D. I. Damianos.
Journal of the Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 102, No WR1, p 151-162, April, 1976. 4 tab, 10 ref.

Descriptors: Water resources, Floods, *Flood damage, *Hazards, *Flood control, Zoning, Prices, Land, Equations, Systems analysis, Regression analysis, Flood plain insurance.
Identifiers: Multiple regression analysis, Economic analysis, *Flood hazards.

Inasmuch as the potential for flooding can reduce property values, individuals will be encouraged to promote government policies that reduce the damages of flooding, such as dams or subsidized flood insurance. On the other hand, policies that limit the use of flood-prone land may reduce the value of such land even beyond the reduction due to flooding potential. Thus, political choice may be biased toward structural or property-enhancing measures as opposed to measures which reduce property values, regardless of what the socially 'best' set of measures might be. To empirically investigate the validity of the preceding arguments, the influence of flood hazard on residential property values has been estimated, examining two case study areas. Use of multiple regression analysis to analyze actual sale prices of land parcels has indicated that: (1) the existence of flood risk lowers land value; (2) structural flood-control measures increase land prices; and (3) the influence of flood-plain zoning cannot be easily identified. (Bell-Cornell)
W76-12529

BENEFIT COST ANALYSIS--A NECESSARY PART OF ENVIRONMENTAL DECISIONING,
Minnesota Univ., Duluth. Dept. of Economics.
J. M. Peterson.
Journal of Environmental Systems, Vol. 5, No. 4, p 291-297, 1975. 1 fig, 5 ref.

Descriptors: *Environment, *Cost-benefit analysis, *Pollution abatement, Water quality, Decision making, Optimization, Costs, Benefits, Ecology, Economics, Wastes, Effluents, Rivers, Social aspects, Systems analysis.
Identifiers: Economic optimum.

Society may use cost-benefit analysis to set priorities in determining the level of environmental pollution they wish to tolerate. The benefits of pollution are derived from the production and consumption of goods and services necessary to life. The estimated social costs of this productive activity are the costs necessary to reduce or eliminate the wastes from the effluents discharged into the environment. Therefore, cost-benefit analysis is appropriate in environmental decision making since its proper use insures that society can reach the ecological stability level without violating the economic optimum. However, ecological stability may not always be a rational choice, particularly when dealing with ecological sub regions rather than the global ecosphere. (Bell-Cornell)
W76-12576

DEVELOPMENT OF RESIDUALS MANAGEMENT STRATEGIES,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 5G.
W76-12581

A METHODOLOGY TO MEASURE THE PERFORMANCE OF THE EPA REGIONAL EIS REVIEW PROCESS,
Argonne National Lab., Ill. Energy and Environmental Studies Div.
B. P. Butz, and M. J. Senew.
Report No. ANL/ES-41. December 1974. 66 p, 1 fig, 14 tab, 18 ref, 2 append. IAG-D4-H543.

Descriptors: *Methodology, *Evaluation, Management, Planning, Environment, *Environmental effects, *Regional analysis.
Identifiers: *Environmental Impact Statement(EIS).

The purpose is to develop a methodology that can be used by the Office of Federal Activities (OFA), part of the Environmental Protection Agency, to measure the performance of the regional Environmental Impact Statement (EIS) review process. Distribution of regional resources for EIS review varies significantly among regions, and without explanation. This study evaluates factors that may cause such differentials; develops criteria that may be used in assessing resources requirements; and develops measures of accomplishment for the EIS review activity. Five regional offices, the OFA staff, the EIS reporting system and available literature were scrutinized. Each region will submit quarterly reports which describe most significant EISs reviewed, and why these EISs were significant together with descriptions of preliminary liason with other agencies, staff assistance supplied and interaction with other EPA offices. To evaluate performance of the review process at the regional level, guidelines are suggested: each type of EIS should meet certain criteria; an OFA team should be established to review selected EISs and determine performance of the region. To improve performance appropriate staff must be available in their region, EIS review must be thorough and uniform, and seminars related to EIS review should be conducted. An example checklist is given which would be used in EIS review. In an appendix a staffing algorithm is given which should aid in establishing appropriate regional staffs. (Smith - North Carolina)
W76-12583

7. RESOURCES DATA

7A. Network Design

ALLOWANCE FOR THE STOCHASTIC CHARACTER OF HYDROLOGICAL DATA IN WATER PROJECT DECISIONS,
National Water Authority, Budapest (Hungary). Engineering Secretariat.
J. Csuka.
Hydrological Sciences Bulletin, Vol. 21, No. 1, p 61-68, March 1976. 1 fig, 4 ref.

Descriptors: *Stochastic processes, *Hydrologic data, *Water management(Applied), *Risks, Value, *Decision making, Water supply, Water resources, Water, Water demand, Irrigation water, Equations, Water utilization, Model studies.
Identifiers: *Water project decisions, Irrigation water supply, Water supply time series, Annual net benefits, Risk pool.

A method was presented for formulating the operating model of water use that included the uncertainty related to the hydrological factors in water management decisions. The model was used for simulating a long time series for water supply, on the basis of which economic data were generated with the help of specific economic indices. The risk pool was estimated, and in the case of project alternatives, decisions allowing for uncertainty were based on the investment costs including the risk pool. Where the costs of risks associated with the alternative selected could be charged, together with the relevant costs against the user, the problem became one of calculating the water rate including risk. The water rate was the annual cost of operation plus the profit and was obtained as the ratio of the water volume delivered. (Roberts-ISWS)
W76-12439

A HIGH SIERRA PRECIPITATION MEASUREMENT PROGRAM, FINAL REPORT ON THE 1975 SEASON,
Atmospherics Inc., Fresno, Calif.
For primary bibliographic entry see Field 2B.
W76-12446

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W76-12521

7B. Data Acquisition

CENTRAL SIERRA PROFILING SNOW GAGE: A GUIDE TO FABRICATION AND OPERATION,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12158

DEVELOPMENT OF A RADIOACTIVE ISOTOPE PROFILING SNOW GAGE,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12159

SEASONAL SNOW SURFACE ENERGY BALANCE IN A FOREST OPENING,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12160

MEASUREMENT OF SNOWPACK WETNESS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-12162

SNOW WETNESS MEASUREMENTS FOR MELT FORECASTING,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 2C.
W76-12165

REMOTE SENSING OR SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W76-12167

O18/O16 ABUNDANCE VARIATIONS IN SIERRA NEVADA SEASONAL SNOWPACKS AND THEIR USE IN HYDROLOGICAL RESEARCH,
Calgary Univ. (Alberta). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W76-12169

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - EXPERIMENT DESCRIPTION,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
I. Katz, A. Arnold, J. Goldhirsh, T. G. Konrad, and W. L. Vann.
Contractor Report NASA CR-2592, Vol. I of III, September 1975. 87 p, 21 fig, 8 tab, 56 ref. NASA/DOD S-70248AG.

Descriptors: *Virginia, *Radar, *Rainfall, *Data processing, Analytical techniques, Equipment, Instrumentation, Antennas, Projects, Rain, Precipitation(Atmospheric), Summer, Statistics, Weather, Storms, Attenuation, Communication, Remote sensing, Monitoring, Measurement, Meteorology, Electrical engineering.
Identifiers: *Wallops Island(Va), *Radar-weather, Space communication, Rain cell statistics.

An experiment was performed at Wallops Island, Virginia, to obtain a statistical description of summer rainstorms. Its purpose was to obtain information needed for design of earth and space communications systems in which precipitation in the earth's atmosphere scatters or attenuates the radio signal. Rainstorms were monitored with the high resolution SPANDAR radar and the 3-dimensional structures of the storms were recorded on digital tape. Volume I of this series described the equipment, the experiment and tabulated all data obtained during the experiment. (See also W76-12179 and W76-12180) (Sims - ISWS)
W76-12178

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - DATA REDUCTION AND ANALYSIS,
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
T. G. Konrad, and R. A. Kropfli.
Contractor Report NASA CR-2592, Vol. II of III, September 1975. 171 p, 97 fig, 10 tab, 10 ref. NASA/DOD S-70248AG.

Descriptors: *Radar, *Rainfall, *Virginia, *Data processing, *Analytical techniques, Precipitation(Atmospheric), Rain, Summer, Weather, Mathematical models, Statistical models, Statistics, Communication, Attenuation, Remote sensing, Measurement, Meteorology.
Identifiers: *Radar-weather, *Wallops Island(Va), Space communications, Rain cell statistics, Rain cell descriptions.

Volume II of the three volumes constituted the final report on the rain statistics program. In this volume, the data reduction and analysis procedures were discussed along with the physical and statistical descriptors used. The statistical modeling techniques were outlined and examples of the derived statistical characterization of rain

cells in terms of the several physical descriptors were presented. Recommendations concerning analyses which can be pursued using the data base collected during the experiment were included. (See also W76-12178 and W76-12180) (Sims - ISWS)
W76-12179

RADAR DERIVED SPATIAL STATISTICS OF SUMMER RAIN - APPENDICES.
Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
Contractor Report NASA CR-2592, Vol. III of III, September 1975. 212 p, 4 append. NASA/DOD S-70248AG.

Descriptors: *Radar, *Virginia, *Rainfall, *Data processing, *Equipment, Electrical engineering, Calibrations, Antennas, Meteorology, Remote sensing, Measurement, Analytical techniques, Meteorological data, Weather data, Statistics.
Identifiers: *Radar-weather, *Wallops Island(Va), Radar-video processor, Radar calibrations, Frequency diversity.

Volume III, Appendices of the Final Report on rain statistics, is a collection of selected important memoranda written during the course of the experiment. The titles of memoranda are: (1) A Frequency Diversity Source Developed for Rain Statistics Program, (2) Technical Manual for Propagation Experiment Controller and Radar Video Processor, (3) SPANDAR Calibration Activities, and (4) Meteorological Summaries for Periods of SPANDAR Rain Observation May Through August 1973. (See also W76-12178 and W76-12179) (Sims - ISWS)
W76-12180

A STUDY OF THE UTILIZATION OF ERTS-1 DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
D. A. Landgrebe.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-27 522, $10.50 in paper copy, $3.00 in microfiche. LARS Informative Note 052375, Final Report, August 1974. 337 p, 93 fig, 54 tab, 15 ref. NASA NAS5-21773.

Descriptors: *Remote sensing, *Illinois, *Indiana, *Missouri, *Idaho, *Kansas, *Wisconsin, *Satellites(Artificial), *Data processing, Mapping, Crops, Agriculture, Soils, Soil classification, Land use, Land classification, Urbanization, Water resources, Surface waters, Lakes, Rivers, Land resources, Vegetation, Equations, Forests, Aerial photography, Analytical techniques.
Identifiers: *ERTS, Chicago(Ill), Gary(Ind), *Lake Freeman(Ind), *Lake Shafer(Ind), Milwaukee(Wis), Finney County(Kan), Tippecanoe County(Ind), Marion County(Ind), White County(Ind), Indianapolis(Ind), Cook County(Ill), Milwaukee County(Wis), *Wabash River Basin.

The general objectives were: (1) to evaluate the applications of ERTS-1 measurements which have been appropriately reduced for use in specific earth resources problems, and (2) to determine the desirable measurements needed in future earth resources systems. Five scientific investigations were reported which were pursued to evaluate the applications of ERTS-1 measurements to specific earth resources problems. To further support these objectives, four specific supporting technology tasks were also included. The nine tasks were all based on the use of digital computer techniques for studying ERTS data in digital form. The conclusions for this study were numerous and were included in each of the nine sections describing results for each project. The overall conclusions were that ERTS-1 data shows potential for crop mapping, urban land use mapping, and water resources mapping. Less favorable results were observed for soil association mapping and earth surface features identification; however these studies were limited in scope. (Sims -ISWS)
W76-12183

STUDY OF THE LOWER STRATOSPHERIC THERMAL STRUCTURE AND TOTAL OZONE FROM NIMBUS-4 IRIS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W76-12184

RAINFALL GENERATION: A NONSTATIONARY TIME-VARYING MULTIDIMENSIONAL MODEL,
Puerto Rico Univ., Mayaguez. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-12208

BASIC REMOTE SENSING INVESTIGATIONS FOR BEACH RECONNAISSANCE: AN INTERIM REPORT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W76-12375

SELF-MONITORING PROCEDURES: BASIC LABORATORY SKILLS (164.6) STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, Md.
For primary bibliographic entry see Field 5A.
W76-12377

REMOTE SENSING OF MARINE HYDROCARBON SEEPS,
Barringer Research Ltd., Rexdale (Ontario). (Assignee).
For primary bibliographic entry see Field 5A.
W76-12411

INFLUENCE OF SURFACE WAVES ON SUBSURFACE CURRENT MEASUREMENTS IN SHALLOW WATER,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W76-12431

A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2F.
W76-12432

REMOTE SENSING OF MISSISSIPPI RIVER CHARACTERISTICS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
J. F. Ruff, M. M. Skinner, B. R. Winkley, D. B. Simons, and D. E. Dorratcague.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12150, p 189-202, May 1976. 9 fig, 4 ref, 1 append.

Descriptors: *Remote sensing, *Aerial photography, *Rivers, *Mississippi River, *Infrared radiation, Photography, Sediments, Temperature, Aerial photography, Turbidity, Potamology, Sedimentology, Flow, Eddies, On-site investigations, Floods.
Identifiers: *Aerial infrared photography, *Thermal infrared imagery.

The Corps of Engineers, Vicksburg District, initiated a data collection program to develop a workable knowledge of the principles relating to the transport of water and sediment to gain a better understanding of the Mississippi River characteristics. Aerial photographs and thermal infrared imagery were collected over two test reches at low and high water stages. Qualitative interpretation of the data related to the river characteristics such as flow patterns, relative velocities, sediment concentration distribution, water-depth effects, and effects of man-made structures. Ground truth information was correlated with the remotely sensed data. (Sims-ISWS)
W76-12442

CAPACITANCE SENSOR FOR SOIL MOISTURE MEASUREMENT,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 2G.
W76-12457

NUCLEAR MAGNETIC RESONANCE SENSORS FOR MOISTURE MEASUREMENT IN ROADWAYS,
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 2G.
W76-12458

INVESTIGATION OF FILTRATION CHARACTERISTICS OF A NONWOVEN FABRIC FILTER,
Marks-Rosen, Inc., Knoxville, Tenn.
For primary bibliographic entry see Field 2G.
W76-12459

AN IMPROVED IN SITU PH SENSOR FOR OCEANOGRAPHIC AND LIMNOLOGICAL APPLICATIONS,
California Univ., Los Angeles. Dept. of Geology.
A. Ben-Yaakov, and E. Ruth.
Limnol Oceanogr. 19(1), 144-150,1974.

Descriptors: *Hydrogen ion concentration, Instrumentation, Oceanography, Limnology, Analytical techniques, Electrodes, Measurement.
Identifiers: *Carbonate saturometry, Ion selective electrodes.

An improved in situ pH sensor and signal conditioner suggest that an accuracy of 0.02 pH can be achieved and that ion selective electrodes can be useful in situ experiments such as carbonate saturometry.--Copyright 1974, Biological Abstracts, Inc.
W76-12479

7C. Evaluation, Processing and Publication

OPTIMIZATION OF REAL TIME DAILY OPERATION OF A MULTIPLE RESERVOIR SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W76-12155

ICE THICKNESS OBSERVATIONS, NORTH AMERICAN ARCTIC AND SUBARCTIC, 1970-71, 1971-72,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-12182

A STUDY OF THE UTILIZATION OF ERTS-1 DATA FROM THE WABASH RIVER BASIN,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.

W76-12183

ATMOSPHERIC STRUCTURE AND VARIABILITY IN AREAS OF CONVECTIVE STORMS DETERMINED FROM 3-H RAWINSONDE DATA,
Texas A and M Univ., College Station. Center for Applied Geosciences.
For primary bibliographic entry see Field 2B.
W76-12185

CONTINUATION OF THE ARIZONA WATER INFORMATION SYSTEM (AWIS),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 10D.
W76-12216

WABASH RIVER SYSTEMS MODEL - TERMINAL REPORT PHASE I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12220

IDENTIFICATION AND MAPPING OF FISHING BANKS ON THE OUTER CONTINENTAL SHELF OF THE GULF OF MEXICO,
Bureau of Land Management, New Orleans, La.
For primary bibliographic entry see Field 6G.
W76-12228

SHADOW LENGTH TABLES FOR LATITUDE 42 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12242

SHADOW LENGTH TABLES FOR LATITUDE 50 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12243

SHADOW LENGTH TABLES FOR LATITUDE 44 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12244

SHADOW LENGTH TABLES FOR LATITUDE 46 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12245

SHADOW LENGTH TABLES FOR LATITUDE 48 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12246

SHADOW LENGTH TABLES FOR LATITUDE 38 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12247

SHADOW LENGTH TABLES FOR LATITUDE 40 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12248

SHADOW LENGTH TABLES FOR LATITUDE 36 DEGREES NORTH,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-12249

REGIONAL SIMULATION OF STREAMFLOW DATA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-12250

A STOCHASTIC MODEL FOR PREDICTING THE PROBABILITY DISTRIBUTION OF THE DISSOLVED-OXYGEN DEFICIT IN STREAMS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-12276

DIGITAL MODEL TO PREDICT EFFECTS OF PUMPING FROM THE ARIKAREE AQUIFER IN THE DWYER AREA, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W76-12277

SURFACE WATER AVAILABILITY, PICKENS COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W76-12280

GUIDE TO THE AVAILABILITY OF HYDROLOGIC DATA, GREATER PITTSBURGH REGION, PENNSYLVANIA.
Geological Survey, Harrisburg, Pa.
R. M. Beall.
Open-file report 76-352, May 1976. 12 p, 1 plate, 33 ref.

Descriptors: *Basic data collections, *Hydrologic data, *Sites, *Maps, *Pennsylvania, Precipitation(Atmospheric), Temperature, Streamflow, Gaging stations, Stage-discharge relations, Water quality, Surface waters, Groundwater, Water levels.
Identifiers: *Pittsburgh region(Pa).

Active primary-collection sites for hydrologic data are shown on a map of the Greater Pittsburgh region (Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland Counties in southwestern Pennsylvania). The sources of data--by publication or responsible agency--are described. Secondary data collection sites have not been shown on the map, but several agencies involved in this activity have been listed. Hydrologic data are collected at the following numbers of identified sites under the auspices of Federal, State, and interstate organizations: Precipitation or temperature 39, surface-water stage or discharge 82, surface-water quality 69, and ground-water levels 7. (Woodard-USGS)
W76-12282

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W76-12283

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, Va.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $4.70. Water-Supply Paper 2160, 1976. 501 p, 1 fig.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Pacific Northwest U.S., Alaska, Hawaii, Basic data collections, Water analysis, Chemical analysis, Water chemistry, Physical properties, Particle size, Streamflow, Sampling, Sites.
Identifiers: *North Pacific Slope basins.

During the water year ending September 30, 1970, the Geological Survey maintained 285 stations on 205 streams in the North Pacific Slope basins, Alaska, and Hawaii and other Pacific areas, for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 158 of these locations for chemical-Quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 235 and daily at 23 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 47 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 12 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W76-12284

DEVELOPING A STATE WATER PLAN: GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-12296

WATER-LEVEL CHANGES IN SOUTHWESTERN KANSAS, 1940-75,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W76-12297

MAPS SHOWING GROUND-WATER CONDITIONS IN THE HARQUAHALA PLAINS AREA, MARICOPA AND YUMA COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
E. E. Denis.
Water-Resources Investigations 76-33 (open-file report), April 1976. 3 sheets, 3 maps, 6 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Maps, Water utilization, Irrigation, Water levels, Water level fluctuations, Water wells, Depth, Water table, Dissolved solids, Fluorides, *Arizona.
Identifiers: *Harquahala Plains area(Ariz), Maricopa County(Ariz), Yuma County(Ariz).

This 3-sheet map report describes ground-water hydrology and water quality in the Harquahala Plains area in Maricopa and Yuma Counties, Arizona. The map titles are: (1) Change in Water Level, December 1966 to January 1975, and Irrigated Area, 1974, (2) Well Depth and Depth to Water, 1975, and (3) Specific Conductance and

Fluoride Concentration, 1974. Deposits of high permeability and storage are discontinuous lenses of clay, silt, sand and gravel; the sand and gravel are the main water-yielding units. The deposits are from less than 300 feet thick near the mountain fronts to more than 1,200 feet thick in the central part of the area. Ground water generally is under water-table conditions but may be under artesian conditions in places. The long-term withdrawal of ground water has resulted in a general decline in water levels. Water-level declines for 1957-75 were more than 200 feet in all the wells in which depth to water was measured. In the Harquahala Plains area the dissolved-solids concentrations in ground water range from less than 500 to more than 800 mg/liter. (Woodard-USGS)
W76-12299

MAP OF OVERDIP SLOPES THAT CAN AFFECT LANDSLIDING IN ARMSTRONG COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
W. R. Kohl.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202, $.75. Miscellaneous Field Studies Map MF-730, 1976. 1 sheet, 1 map, 8 fig, 1 tab, 8 ref.

Descriptors: *Landslides, *Slopes, *Maps, *Sites, *Pennsylvania, Erosion, Avalanches, Rock mechanics, Geology.
Identifiers: Armstrong County(Pa).

This map shows areas of overdip slopes in Armstrong County, Pa. A slope is 'overdip' where the hill slope is steeper than the inclination of the outcropping rock layers and both slope and layers dip in the same general direction. Symbolized on the map and accompanying explanation are overdip slopes where rock layers are inclined more than 40 feet per mile and areas where rock layers have a lesser degree of inclination or are horizontal. Not symbolized are areas where rock layers dipping more than 40 feet per mile crop out in flat land or on slopes that are not overdip. Localities typifying slope conditions are described. Overdip slopes are significant to the problem of landsliding because: (1) Jointed (fractured) rocks on an overdip slope have no built-in 'mechanical' resistance to downslope movement. (2) The dip of rock layers commonly causes groundwater to percolate to an overdip slope. Water may be the most significant factor in landsliding; the chief agent in lubrication and rock decomposition, as well as a contributor to weight of soil on the slope. The overdip-slope map is but one of a number of tools useful in defining areas where landslides may occur. Others include slope maps, geologic maps, and soil maps. (Woodard-USGS)
W76-12300

MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-12386

MESOSCALE COMPONENT OF THE GEOSTROPHIC FLOW AND ITS TEMPORAL AND SPATIAL VARIABILITY IN THE CALIFORNIA CURRENT OFF MONTEREY BAY IN 1973-74,
Naval Postgraduate School Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-12387

PLOT-DERIVED PARAMETERS FOR BASIN COMPUTATIONS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W76-12438

ALLOWANCE FOR THE STOCHASTIC CHARACTER OF HYDROLOGICAL DATA IN WATER PROJECT DECISIONS,
National Water Authority, Budapest (Hungary). Engineering Secretariat.
For primary bibliographic entry see Field 7A.
W76-12439

A HIGH SIERRA PRECIPITATION MEASUREMENT PROGRAM, FINAL REPORT ON THE 1975 SEASON,
Atmospherics Inc., Fresno, Calif.
For primary bibliographic entry see Field 2B.
W76-12446

SATELLITE SNOW OBSERVATIONS AND SEASONAL STREAMFLOW FORECASTS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2C.
W76-12468

THE USE OF COMPUTER TECHNIQUES AND AUTOMATION FOR WATER RESOURCES SYSTEMS.
Economic Commission for Europe (UN), New York. Committee on Water Problems, Economic and Social Council.
For primary bibliographic entry see Field 6A.
W76-12535

PRESENT SITUATION AND TRENDS IN THE APPLICATION OF ADVANCED METHODS AND TECHNIQUES FOR WATER RESOURCES MANAGEMENT.
Economic Commission for Europe (UN), New York.
In: The Use of Computer Techniques and Automation for Water Resources Systems, Washington, D.C., 1974, Volume II. p 1-6. 8 ref.

Descriptors: *Water resources development, Computers, *Management, *Automation, Planning, Methodology, Design, Optimum development plans, Personnel, Economics, Social aspects, Europe, Operations, Forecasting, Monitoring, Water quality, River basins.

It is generally recognized that water resources management (as well as hydrology) is the least computerized of the physical sciences and technically advanced branches of industry. The existing lag in water management and automated control--explained in the past by the abundance, relative purity, and low cost of water in most industrialized countries--can no longer be justified today. The need to introduce computerized regional dispatching boards in regional control and management has been fully recognized in many ECE countries. This article considers some of the main points deemed important for the effective application of advanced techniques of management of water resources systems. Discussed are: (1) training of personnel for effective application of new tools of management; (2) planning and design of water resources systems with application of computers; (3) computerization and automation to rational operation of water resources systems; and (4) organization and institutional prerequisites for efficient application of computers and automation for water resources management. (See also W76-12535) (Bell-Cornell)
W76-12536

A QUANTITATIVE MODEL FOR THE PLANNING OF SURFACE WATER RESOURCES: USE OF MIXED VARIABLE LINEAR PROGRAMMING,
Ardour-Garonne Agency, Toulouse (France), Programming Group.
For primary bibliographic entry see Field 4A.
W76-12546

RIVER SYSTEM MODELLING FOR OPERATIONAL FORECASTING,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
For primary bibliographic entry see Field 4A.
W76-12550

USE OF OPTIMIZATION MODELS FOR WATER RESOURCES ALLOCATION AND CHOICE OF INVESTMENTS BY MEANS OF COMPUTERS,
Research and Design Inst. for Water Resources Engineering, Bucharest (Rumania). Water Economy Section.
For primary bibliographic entry see Field 6A.
W76-12558

USE OF INVESTMENT MODELS AND CHOICE OF ALTERNATIVE DECISIONS FOR THE OPTIMUM DISTRIBUTION OF WATER RESOURCES AT THE STAGE OF PLANNING BY MEANS OF COMPUTERS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 6A.
W76-12561

COMPUTER APPLICATION IN PROCESSING TECHNICAL AND ECONOMIC DATA FOR OPTIMIZING COMPLEX WATER RESOURCES SYSTEMS,
Belorussian Central Research Inst. for Water resources, Minsk.
For primary bibliographic entry see Field 6A.
W76-12565

FLOOD HAZARD ANALYSES FOR LOWER MARSH CREEK (INCLUDING SELECTED TRIBUTARIES), BANNOCK COUNTY, IDAHO.
Soil Conservation Service, Boise, Idaho.
For primary bibliographic entry see Field 4A.
W76-12580

CLARKS CREEK FLOOD PLAIN STUDY, CATAWBA COUNTY, NORTH CAROLINA.
Soil Conservation Service, Raleigh, N. C.
For primary bibliographic entry see Field 4A.
W76-12582

FLOOD HAZARD ANALYSES REPORT: EAST BRANCH NIMISHILLEN CREEK, STARK COUNTY, OHIO.
Soil Conservation Service, Columbus, Ohio.
For primary bibliographic entry see Field 4A.
W76-12586

MULTIPURPOSE COMPUTER FOR THE HONOLULU BOARD OF WATER SUPPLY,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 4B.
W76-12589

FLOOD HAZARD INFORMATION: BACKLICK CREEK, VIOLET TOWNSHIP, FAIRFIELD COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W76-12592

FLOOD PLAIN INFORMATION: FRESHWATER CREEK, HUMBOLDT COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-12593

FLOOD PLAIN INFORMATION: YELLOW RIVER, PART III, METROPOLITAN ATLANTA, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-12595

8. ENGINEERING WORKS

8A. Structures

COASTAL ENGINEERING CONFERENCE. FOURTEENTH. PROCEEDINGS. COPENHAGEN, DENMARK, JUNE 24-28, 1974.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 5G.
W76-12221

OCEAN 72, IEEE INTERNATIONAL CONFERENCE ON ENGINEERING IN THE OCEAN.
Institute of Electrical and Electronics Engineers, Inc., New York.
For primary bibliographic entry see Field 5G.
W76-12224

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 5: EFFECTS OF LONGREACH STREAM CHANNELIZATION ON DISTRIBUTION AND ABUNDANCE OF FISHES,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12230

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 4: THE EFFECTS OF LONGREACH CHANNELIZATION ON HABITAT AND INVERTEBRATE IN SOME IOWA STREAMS,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12231

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT NO. 3 SOME EFFECTS OF SHORT-REACH CHANNELIZATION ON FISH AND FISH FOOD ORGANISMS, IN CENTRAL IOWA WARM WATER STREAM,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12232

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT 2. A STUDY OF THE IMPACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12233

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARM WATER SPORT FISH IN IOWA: SUBPROJECT I INVENTORY OF MAJOR STREAM ALTERATIONS IN IOWA,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12234

STRUCTURAL MODEL STUDIES FOR THE HENDRIK VERWOERD DAM,
Wimpey (George) and Co. Ltd., Hayes (England). Wimpey Central Lab.
J. C. Chapman, B. Creber, and P. J. D. Guile.
The Institution of Civil Engineers, Proceedings, Part 2, Research and Theory, Vol 57, p 467-491, September 1974. 22 fig, 1 tab.

Descriptors: *Dams, *Model studies, *Structural models, *Stress analysis, Design, Behavior, Instrumentation, Spillways, Culverts, Gravity, Hydrostatic pressure.
Identifiers: Stress distribution.

The Hendrik Verwoerd Dam has a crest length of 3000 ft with a maximum height of 280 ft, and a storage capacity of 5 million acre feet. The main purpose of the model analysis was to determine the stress distribution in the control structures incorporated in the dam, but because it was found necessary to model the complete dam, much information was also obtained concerning the structural behavior of the dam at working load and at various overload conditions up to failure. The model was built of concrete to a scale of one to a hundred. Gravity load was applied within the body of the dam by vertical wires loaded by hydraulic jacks below the model. The behavior of the model dam under design load was satisfactory and the stresses were of the anticipated order of magnitude; the stresses showed good agreement with the results of a finite element analysis. The vertical tensile stresses in the spillway culvert walls were higher than those which had been estimated by simple calculation. This is due to the effect of the arch thrusts acting on the control structures and it was this effect that the model was particularly designed to study. The results of the model analysis indicated that substantial reinforcement was required in the walls between the spillway culverts to resist the tensile stresses. (Bell-Cornell)
W76-12523

8B. Hydraulics

PLANNING THE LOCATION AND CAPACITY OF FLOOD CONTROL STRUCTURES,
Cornell Univ., Ithaca, N. Y. Coll. of Engineering.
For primary bibliographic entry see Field 4A.
W76-12156

SUPERCRITICAL FLOW AT OPEN-CHANNEL JUNCTIONS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer District, Los Angeles, Calif.
D. A. Barela.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A014 892, $6.75 in paper copy, $3.00 in microfiche. Report No. 2-100, July 1975. 161 p, 55 photo, 42 plate, 1 tab.

Descriptors: *Open channels, *Junctions, *Supercritical flow, *Model studies, Hydraulic models, Channels, Channel flow, Channel improvement, Turbulence, Waves(Water), Flow, Open channel flow, Structures, Drainage, Drainage systems, Storm drains, Civil engineering, Hydraulics, *California.
Identifiers: *Los Angeles area(Calif), Structure design.

Hydraulic model tests made to generalize and verify the hydraulic design of confluence structures are described. Model investigation of certain confluences showed unsatisfactory flow conditions involving considerable turbulence in the confluence structure and transverse waves in the channel downstream. Major changes in particular designs were effected. Various schemes were introduced in each case. Lengthening the transition downstream from divider wall and minimal angle of intersection of the two channels were found to be the most efficient solutions. (Sims - ISWS)
W76-12187

A LABORATORY EVALUATION OF TRASH RACKS FOR DROP INLETS,
Agricultural Research Service, Stillwater, Okla.
G. C. Hebaus, and W. R. Gwinn.
Technical Bulletin No. 1506, September 1975. 70 p, 76 fig, 24 tab, 2 ref, 1 append.

Descriptors: *Trash racks, *Hydraulic structures, *Hydraulic models, *Spillways, Intakes, Model studies, Laboratory tests, Prototype tests, Testing, Reservoirs, Evaluation, Detention reservoirs.
Identifiers: Drop inlets, Closed conduit spillways.

Performance tests for trash racks on closed-conduit spillways, using one-eighth-scale models, were developed and standardized by comparison with the performance of full-scale prototype structures mounted on a drop inlet to a 2-foot-diameter conduit. Flow data for use in spillway design were collected by testing models and prototypes of standard and experimental designs under a range of flow conditions, with clear water and standardized trash loads. The following recommendations were made: for two-way drop inlets in open water, there should be a rack with a solid plate and a solid skirt extending below the inlet crest level. Ventilation must be provided between the plate and skirt so that siphoning will not occur, unless such action is desired. If the vent is made by leaving an open space between the underside of the plate and the top of the skirt, this open space should be covered with mesh to prevent the entry of sticks. Rack bars should be placed in a plane sloping downward from the bottom edge of the skirt to the side of the drop inlet, to prevent rigid trash, floating alongside the drop inlet at low water, from rising with the water and entering the space between the skirt and the drop inlet side. The rack on the four-way square drop inlet performed well. However, if a rack of this type is used, a mesh-covered ventilation space between the skirt and the plate should be provided. The racks investigated in this study were generally best suited for open-water installations. (Humphreys - ISWS)
W76-12189

MASS TRANSPORT IN GRAVITY WAVES ON A SLOPING BOTTOM,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-12190

APPLICABILITY OF UNIT STREAM POWER EQUATION,
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 2J.
W76-12193

DISCHARGE PREDICTION, PRESENT AND FORMER, FROM CHANNEL DIMENSIONS,
Wisconsin Univ., Madison. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-12198

THERMAL ANALYSIS OF FROZEN EMBANKMENT ISLANDS,
Puget Sound Naval Shipyard, Bremerton, Wash.
For primary bibliographic entry see Field 2L.
W76-12200

INCREASING THE MEAN CURRENT IN COASTAL CHANNELS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2L.
W76-12201

SEA LEVEL COMPUTATIONS OF THE BALTIC WITH A 20-CANAL MODEL,
Fishery Board of Sweden, Goteborg. Hydrographic Dept.
For primary bibliographic entry see Field 2L.

W76-12205

PROPOSED CROSS-FLORIDA BARGE CANAL: WATER-QUALITY ASPECTS, WITH A SECTION ON WASTE-ASSIMILATIVE CAPACITY,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W76-12283

FLOOD DISCHARGE OF STREAMS IN NEW MEXICO AS RELATED TO CHANNEL GEOMETRY,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2E.
W76-12294

AN ANALYSIS OF THE NUMERICAL SOLUTION OF THE TRANSPORT EQUATION,
Princeton Univ., N. J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-12434

INTERACTION OF WATER WAVES WITH CYLINDER BARRIER,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
S. R. Massel.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12125, p 165-187, May 1976. 11 fig, 23 ref, 5 append.

Descriptors: *Waves(Water), Hydrodynamics, *Drag, *Coastal structures, Coastal engineering, Analysis, Barriers, Equations, Mathematical studies, Pressure, Velocity.
Identifiers: *Wave forces, *Circular cylinders, Inertia, Mathematical analysis, Diffraction, Transmission coefficient.

The spatial periodic function was used in the investigation of the interaction of water waves with a row of evenly spaced vertical cylinders. The direction of the incident waves was arbitrary. The effect of the neighboring cylinders on the wave force on a given cylinder was derived. The equivalent mass coefficients were calculated. The theoretical results were compared with previous experimental results on the inertia-predominant wave force and on the transmission coefficient for the barrier. (Adams-ISWS)
W76-12441

WAVE FORCES ON VERTICAL CIRCULAR CYLINDER,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
S. K. Chakrabarti, A. L. Wolbert, and W. A. Tam.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW2, Proceedings Paper 12140, p 203-221, May 1976. 11 fig, 1 tab, 11 ref, 2 append.

Descriptors: *Hydrodynamics, *Drag, *Frequency, *Laboratory tests, Waves(Water), Analysis, Froude number, Reynolds number, Hydraulic similitude, Coastal structures, Model studies, Equations, Mathematical studies.
Identifiers: *Wave forces, Inertia, Lift, *Circular cylinders.

Tests were conducted at Reynolds numbers less than 30,000. Hydrodynamic parameters, inertia, drag, and lift coefficients were calculated from the measured force data. Coefficient values obtained for 1 ft sections were used to correlate the measured forces on the entire cylinder. The coefficients correlated well with the period parameter which followed the Froude scale. Resultant forces were found to be as much as 60% higher than the in-line force. Lift coefficients were calculated to the fifth harmonic as functions of the period parameter. The frequencies of the lift force were found to have a definite trend with the number of eddies formed, which depended on the period parameter. Dependence on the period parameter made scaling to other sizes straightforward except for uncertain effects from changing the Reynolds number from subscritical to supercritical. (Adams-ISWS)
W76-12443

THE DEPTH VS. DEPTH PLOT: AN AID TO SELECTING PIEZOMETER INSTALLATION DEPTHS IN BOREHOLES,
Piteau Gadsby Macleod Ltd. North Vancouver (British Columbia).
R. C. Dick.
Engineering Geology, Vol. 10, No. 1, p 37-42, May 1976. 5 fig, 2 ref.

Descriptors: *Depth, *Graphical methods, *Piezometers, *Boreholes, *Stability, Slope stability, Soil water, Soil pressure, Artesian aquifers, Water table, Permeability, Water pressure, Potentiometric level, Reservoir leakage, Water level fluctuations, Perched water, Groundwater.
Identifiers: Anomalies.

The location of the piezometric surface within a soil or rock mass is often the critical factor in stability analysis and in evaluations of reservoir water-tightness. Sealed piezometers are now almost universally used to measure water pressure within the mass. The location of these piezometers must be decided immediately upon completion of each borehole. A common aid to making this decision is a plot of borehole depth and borehole water level as functions of time. This paper introduced another way to evaluate the same data, with the borehole water depth plotted as a function of borehole depth. Anomalies can be detected more easily, and piezometers installed within these zones. Examples were given. (Visocky - ISWS)
W76-12447

ANALYTIC SOLUTIONS FOR DETERMINING NATURALLY FRACTURED RESERVOIR PROPERTIES BY WELL TESTING,
Instituto Mexicano del Petroleo, Mexico City.
A. O. de Swaan.
Society of Petroleum Engineers Journal, Vol. 16, No. 3, p 117-122, June 1976. 3 fig, 1 tab, 10 ref, append.

Descriptors: *Mathematical models, *Fracture permeability, *Oil reservoirs, *Compressible flow, Equations, Pressure, Drawdown, Hydraulic properties, Porosity, Flow, Graphical methods, Diffusivity, Porous media.
Identifiers: *Matrix blocks, Well testing.

A completely unsteady-state theory was developed that described the well pressure response of infinite, naturally fractured reservoirs of the type composed by high-permeability fractures and tight matrix blocks. The theory exclusively involved flow properties and dimensions of the fractures and the matrix blocks; no extra adjusting parameters were needed for predicting the pressure response of a reservoir with known properties. Comparison of computed pressure-drawdown theoretical curves with results of a numerical model applied to idealized reservoirs showed a good fit. It was concluded that an evaluation of the following reservoir properties is possible from well-test pressure plots: the fractures' kh product and the average product of the matrix porosity by a characteristic dimension of the matrix blocks. Thus, the model allowed comparison of well-test pressure response with the formation measurements. (Visocky - ISWS)
W76-12449

OPTIMIZATION OF DESIGN CAPACITY OF AN AQUEDUCT,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4A.
W76-12526

BAYESIAN APPROACH TO TILE DRAIN DESIGN,
Ecole Polytechnique Federale de Lausanne (Switzerland). Dept. of Agriculture.
A. Musy, and L. Duckstein.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 102, No IR3, p 317-334, September 1976. 7 fig, 3 tab, 30 ref.

Descriptors: *Tile drainage, *Land reclamation, *Decision making, Agricultural engineering, Design, Water management(Applied), Hydrology, Equations, Economics, Costs, Systems analysis, Methodology, Crops, Evaluation, Optimization, *Tile drains, Risks.
Identifiers: *Bayes theorem, *Decision theory, *Uncertainty principle, Systems engineering, Probability theory.

Economic and sociopolitical aspects of land reclamation in areas that necessitate drainage are combined with technical problems to yield a set of possible decisions, among which an optimum design is chosen. The loss or objective function is the sum of the expected damage caused by the submersion of given crops resulting from extreme rainfall events, and the initial cost of the reclamation. When the parameter uncertainty in the probability distribution function of extreme events is taken into account in the loss function, a Bayes risk function is obtained. The Bayes decision theoretic (BDT) approach consists of seeking a decision that minimizes the Bayes risk function. The BDT also evaluates the decision taken and compares the expected cost of delaying the construction to the worth of additional information resulting from such a delay. The practical example of an intensive agricultural system with different types of soils and crops illustrates the methodology. Crop loss functions and probability distributions of events are assumed on the basis of empirical observations. (Bell-Cornell)
W76-12527

PROFESSIONAL REQUIREMENTS OF MODERN WATER ENGINEERS INVOLVED IN RIVER BASIN MANAGEMENT UTILIZING CONTEMPORARY TOOLS,
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
For primary bibliographic entry see Field 4A.
W76-12537

DYNAMIC PROGRAMMING FOR DETERMINATION OF A STORM WATER OUTLET SYSTEM OF PIPES AND FLOOD-DAMPING DAMS,
Societe Grenobloise d'Etude et d' Applications Hydrauliques (France).
For primary bibliographic entry see Field 4A.
W76-12542

SEWER LAYING SYSTEM,
W. R. Brown.
United States Patent 3,956,901. Issued May 18, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 3, p 994, May, 1976. 1 fig.

Descriptors: *Patents, *Construction equipment, *Sewers, *Pipelines, *Tiles, Conduits, Conveyance structures, Engineering structures.

A patent for a tile carrying and service device used for laying sewer systems is described. The device consists of the following components: a chassis with wheels, pipe handling bays situated on each

side of the chassis, platforms in the pipe bays for support of the tiles, a means for conveying the tiles which are discharged transversely from the pipe bay platforms to a point distally from the chassis, a lift means for the platforms, and a means for discharging individual tiles from the pipe bays. (Kreager-FIRL)
W76-12605

WASTEWATER COLLECTION, (LITERATURE REVIEW),
Nottingham (H. D.) and Associates, Inc., McLean, Va.
For primary bibliographic entry see Field 5D.
W76-12631

8C. Hydraulic Machinery

WARM WATER STREAM ALTERATION IN IOWA: EXTENT, EFFECTS ON HABITAT, FISH, AND FISH FOOD, AND EVALUATION OF STREAM IMPROVEMENT STRUCTURES (SUMMARY REPORT),
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 4C.
W76-12235

TIDE-POWERED ELECTRICAL GENERATOR,
J. V. Rusby.
U. S. Patent No. 3,959,663, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 4, p 1886, May 25, 1976.

Descriptors: *Patents, *Energy conversion, *Energy transfer, *Tidal energy, *Tidal water, *Tidal powerplants, Engineering structures, Electric powerplants, Generators, Storage.
Identifiers: Jack bars, Weights.

A tide-powered electrical generator is described in which the energy from successive rising tides is stored in the form of potential energy for selective conversion to electricity. A float is constrained to vertical motion and it raises on successive tides a weight by means of a jack bar to reach a maximum predetermined height on a stable support structure where the weight is supported until release for the generation of electricity. Provision is made for the prevention of damage to the generator by excessive tidal rises. (Sinha - OEIS)
W76-12403

SUBMERSIBLE PUMPS UPGRADE SEWAGE HANDLING.
For primary bibliographic entry see Field 5D.
W76-12614

WASTEWATER COLLECTION, (LITERATURE REVIEW),
Nottingham (H. D.) and Associates, Inc., McLean, Va.
For primary bibliographic entry see Field 5D.
W76-12631

ALBUQUERQUE PLANT DESIGNED WITH COMPUTER IN MIND,
William Matotan and Associates, Albuerque, New Mex.
For primary bibliographic entry see Field 5D.
W76-12638

8D. Soil Mechanics

EFFECT OF SEEPAGE ON EMBANKMENT DEFORMATIONS DUE TO WATER LOADING,
Sydney Univ. (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-12188

ENGINEERING PROPERTIES OF COMPACTED CLAY CONDITIONED BY SATURATION AND FREEZE-THAW CYCLES,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 2C.
W76-12453

CASE STUDIES OF VARIATIONS IN SUBGRADE MOISTURE AND TEMPERATURE UNDER ROAD PAVEMENTS IN VIRGINIA,
Virginia Highway and Transportation Research Council, Charlottesville.
For primary bibliographic entry see Field 2C.
W76-12454

CAPACITANCE SENSOR FOR SOIL MOISTURE MEASUREMENT,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 2G.
W76-12457

NUCLEAR MAGNETIC RESONANCE SENSORS FOR MOISTURE MEASUREMENT IN ROADWAYS,
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 2G.
W76-12458

DETERMINATION OF DISPERSIVE CLAY SOIL ERODIBILITY BY USING A PHYSICAL TEST,
Texas Univ. at Arlington.
For primary bibliographic entry see Field 2G.
W76-12460

8E. Rock Mechanics and Geology

THE DEPTH VS. DEPTH PLOT: AN AID TO SELECTING PIEZOMETER INSTALLATION DEPTHS IN BOREHOLES,
Piteau Gadsby Macleod Ltd. North Vancouver (British Columbia).
For primary bibliographic entry see Field 8B.
W76-12447

8F. Concrete

PAVEMENT CRACKING IN WEST TEXAS DUE TO FREEZE-THAW CYCLING,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W76-12452

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
S. D. Tayabji, and E. J. Barenberg.
In: Frost, Moisture, and Erosion; Transportation Research Record 532, Transportation Research Board, National Research Council, Washington, D. C., p 49-63, 1975. 5 fig, 10 tab, 10 ref.

Descriptors: *Road construction, *Paving, *Permeability, Roads, Highways, Bituminous materials, Drainage, Subsurface drainage, Laboratory tests, Soils, Clays, Soil properties, Civil engineering *Illinois.
Identifiers: *Pavements, Pavement drainage.

This study was aimed at evaluating the performance of pavement drainage systems in Illinois constructed with locally available aggregate sources. The study was limited to investigating the use of open-graded, hot-mixed bituminous aggregate mixtures in pavement drainage systems. A preliminary investigation was carried out in the laboratory to evaluate the permeability and the stability of the open-graded bituminous aggregate mixtures. Specimens were prepared according to the procedures in ASTM D1559. Permeability tests (in which a constant-head test that allowed the measurement of permeability at low heads was used) and stability tests were performed on the same specimen. From the results of the preliminary investigations, six test pavements incorporating different design concepts were tested at the University of Illinois test track. Dynamic loading was applied to the test pavements, and water was passed through the open-graded bituminous aggregate drainage layers to simulate surface and lateral infiltration. Permeability tests at a constant head were carried out regularly on the pavement test sections. The progress of rutting in the test pavements was also recorded. Results of these limited tests indicated that open-graded bituminous aggregate mixtures possess a high order of permeability and that care must be taken to prevent the migration of subgrade fines into these aggregate layers if satisfactory drainage is to be achieved. This paper discussed methods that can be used to ensure satisfactory performance of pavements made of open-graded aggregates. (See also W76-12451) (Sims-ISWS)
W76-12456

8G. Materials

HYGIENIC AND TOXICOLOGICAL EVALUATION OF SOME GRADES OF RUBBER USED IN DOMESTIC WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Municipal Sanitary-Epidemiological Center, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W76-12252

EVALUATING A LOW-ENERGY, HIGH-VOLUME PUMP FOR ODOR REDUCTION FROM LIVESTOCK WASTE LAGOONS BY MIXING,
Oklahoma State University, Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-12344

FROST, MOISTURE, AND EROSION.
Transportation Research Board, Washington, D. C.
For primary bibliographic entry see Field 2G.
W76-12451

EVALUATION OF PAVEMENT DRAINAGE SYSTEMS MADE OF LAYERS OF OPEN-GRADED BITUMINOUS AGGREGATE MIXTURES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8F.
W76-12456

WATER SUPPLIES FROM ULSTER VALLEY GRAVELS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 4B.
W76-12524

ANTHRACITE ACTIVATED CARBONS: MANUFACTURE AND APPLICATIONS,
For primary bibliographic entry see Field 5D.
W76-12658

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

OUTDOOR RECREATION PLANNING AND RESEARCH IN THE U.S.A.,
National Foundation for Scientific Research (NFWO), Ghent (Belgium).
For primary bibliographic entry see Field 6B.
W76-12585

9D. Grants, Contracts, and Research Act Allotments

1973-1974 SALINE WATER CONVERSION SUMMARY REPORT.
Office of Saline Water, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-12343

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

CONTINUATION OF THE ARIZONA WATER INFORMATION SYSTEM (AWIS),
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 10D.
W76-12216

10C. Secondary Publication And Distribution

A REVIEW OF LITERATURE ON THE USE OF POTASSIUM PERMANGANATE (KMN04) IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
For primary bibliographic entry see Field 5C.
W76-12335

CHEMICALS AND ALLIED PRODUCTS (LITERATURE REVIEWS),
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 5D.
W76-12412

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEWS),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W76-12415

URBAN RUNOFF AND COMBINED SEWER OVERFLOW, (LITERATURE REVIEW),
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 5D.
W76-12627

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W76-12628

WASTEWATER TREATMENT - PHYSICAL AND CHEMICAL METHODS, (LITERATURE REVIEW),
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-12629

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW),
Delaware Univ., Dept. of Civil Engineering. Newark.
For primary bibliographic entry see Field 5D.
W76-12630

LAGOONS AND OXIDATION PONDS, (LITERATURE REVIEW),
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-12671

MIXING AND TRANSPORT, (LITERATURE REVIEW),
Argonne National Lab., Ill. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W76-12672

BIOLOGICAL FILTERS, (LITERATURE REVIEW),
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-12674

10D. Specialized Information Center Services

CONTINUATION OF THE ARIZONA WATER INFORMATION SYSTEM (AWIS),
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. E. Foster, and K. J. DeCook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 560, $4.50 in paper copy, $3.00 in microfiche. Completion Report, (1975). 48 p, 2 tab, 6 ref, 4 append. OWRT A-031-ARIZ(2). 14-31-0001-5003.

Descriptors: *Data processing, *Data storage and retrieval, *Hydrologic data, Information retrieval, *Systems analysis, *Arizona, Information exchange, Water quality, Water supply, Groundwater, Watersheds(Basins), Data collections.
Identifiers: *Arizona Water Information System.

The Arizona Water Information System (AWIS) was developed for storage and retrieval of water resources data and for dissemination of water resources information pertaining to the State of Ariz. Collectively, the AWIS system contains a number of distinct elements. The Activity File is a listing of water resource activities and projects dating from 1961, which can be accessed by keywords or by agency to retrieve abstracts and information on approximately 1,000 projects; the file recently was updated and additional projects covered in a regional program pertaining to the Lower Colo. River Basin portions of Ariz., Calif., and Nev. A bimonthly Ariz. Water Resources News Bulletin and a companion Project Information Bulletin were initiated under this project and will be continued as a cooperative effort of the Ariz. Water Commission and the Univ. of Ariz. Water Resources Research Center and Office of Arid Lands Studies. A cassette-tape pilot series on Ariz. water trends also was produced and evaluated for use potential, which appears favorable. A western state conference on water information dissemination, sponsored by this project and the Office of Water Research and Technology, was held in Phoenix in 1973, to discuss the above kinds of activities in the several states and the possibilities for cooperative regional activities. The capacity for interactive hydrologic data processing, utilizing the DEC-10 computer system at the Univ. of Ariz., was developed in 1974 with the support of the Ariz. Water Commission (AWC). Groundwater and quality-of-water data furnished by AWC have been stored progressively in the system, and are retrievable by remote terminal through telephone hookup, by quarter-township grid location or by drainage basin.
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A. CENTERS OF COMPETENCE		
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Ocean Engineering Information Service (Patents)	W76-12391 12398--12405 12408--12411	13

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER (CONTINUED)		
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U. S. Geological Survey	W76-12276--12285 12287--12290 12292--12300	23

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